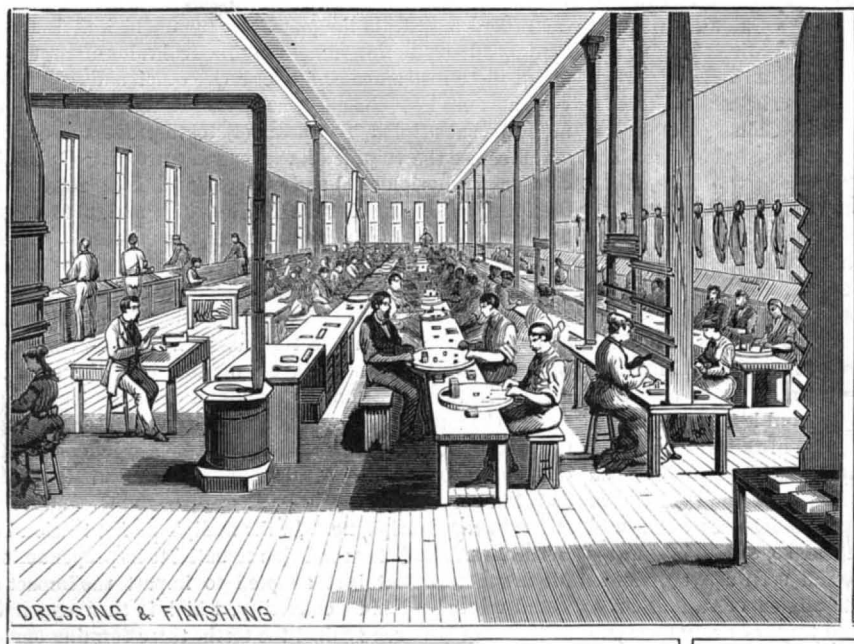
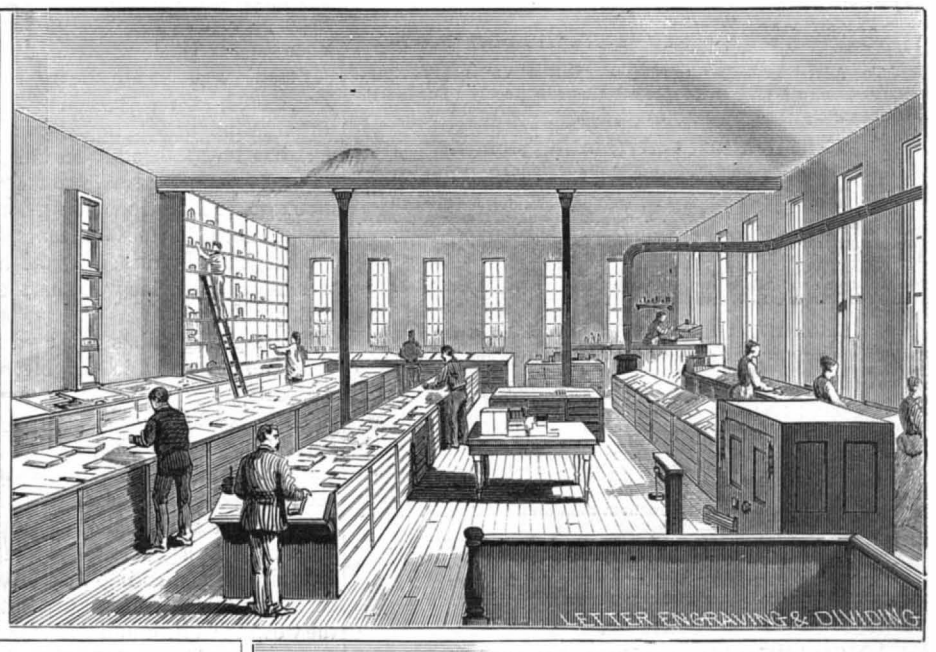
SCIENTIFIC AMERICAN

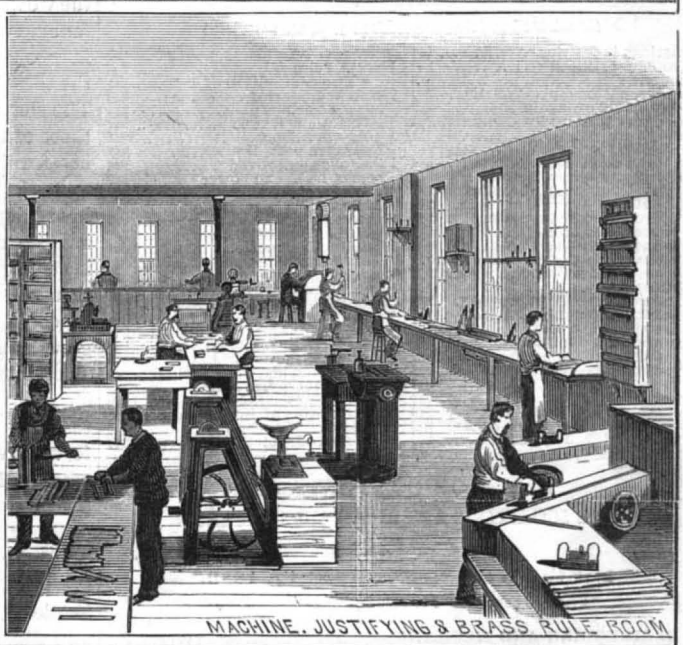
[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

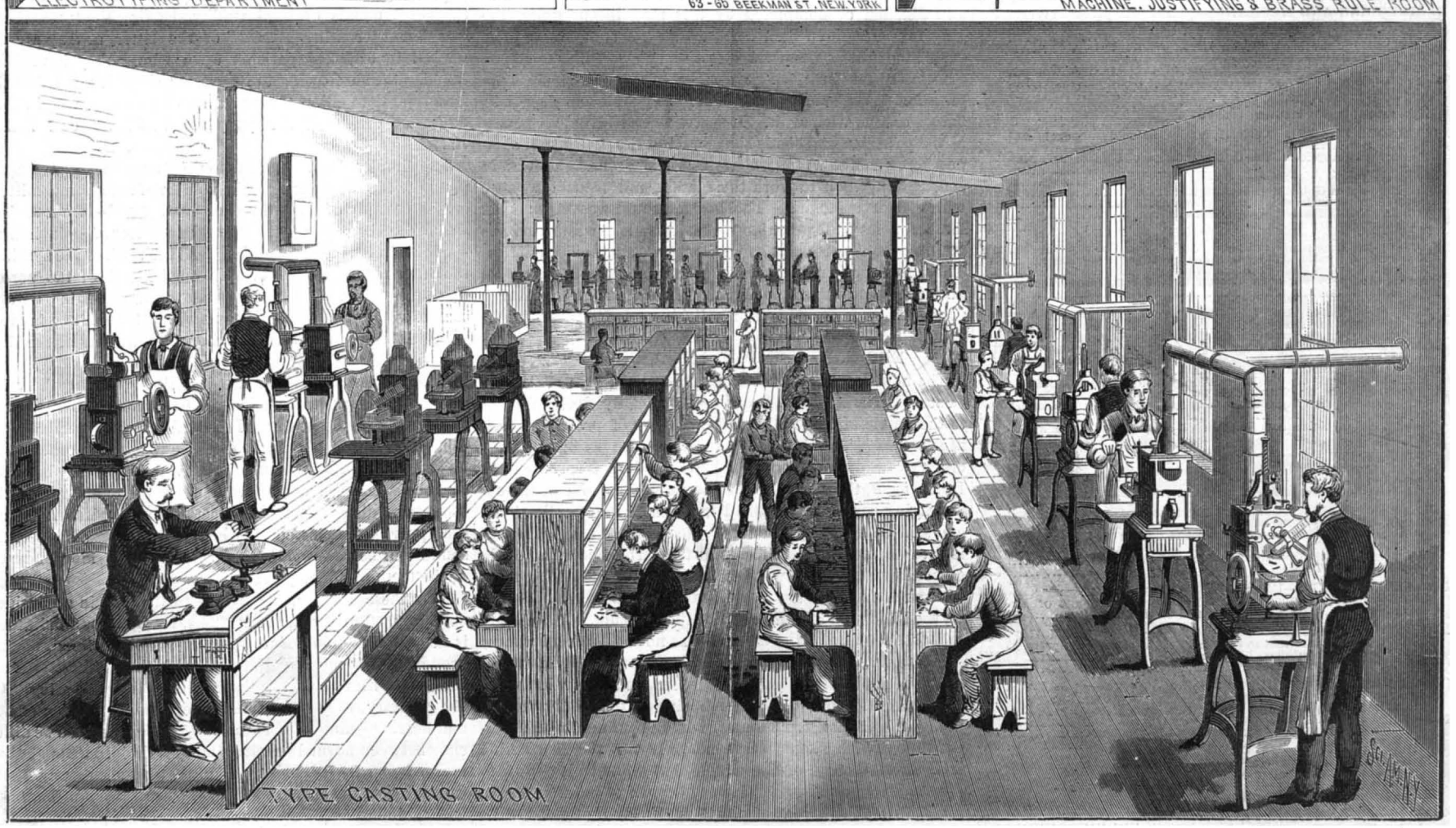
A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLII.—No. 16. [NEW SERIES.] NEW YORK, APRIL 17, 1880. [$3.20 per Annum. [POSTAGE PREPAID.]



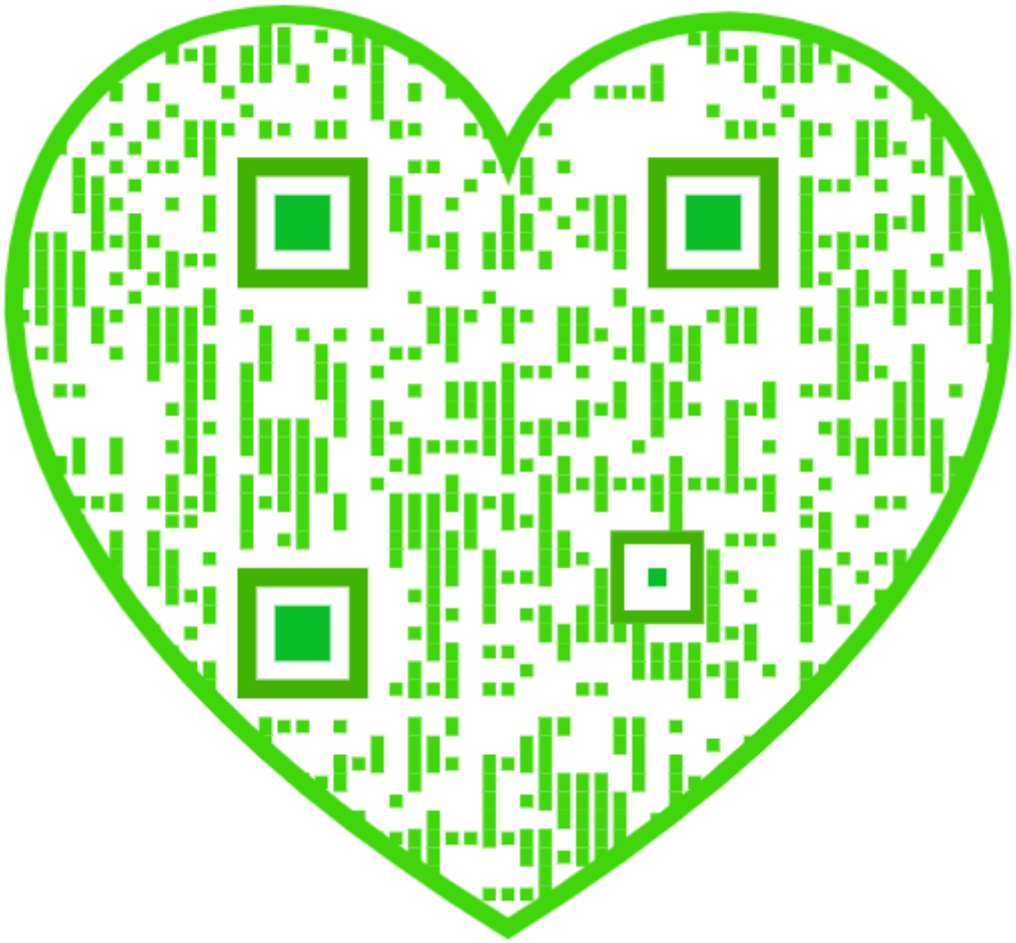






THE MANUFACTURE OF PRINTER'S TYPE.—FARMER, LITTLE & CO.'S FOUNDRY NEW YORK CITY.—[See page 244.]

© 1880 SCIENTIFIC AMERICAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order Address
MUNN & CO., 37 Park Row, New York.

☞ To Advertisers.—The regular circulation of the SCIENTIFIC AMERICAN is now **Fifty Thousand Copies** weekly For 1880 the publishers anticipate a still larger circulation.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 37 Park Row, N Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, APRIL 17, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

American industries*..... 244
Atropine, artificial..... 242
Check-row*..... 243
Chinese, national plant of the... 240
Coffee, effect of, again 242
Collegians, illiterate 243
Corn planter*..... 223
Deaf, aids for the..... 240
Diamond making..... 248
Edison's horseshoe lamps..... 241
Electric lamp, Andre-Brougham* 245
Fish cultural Assn., American. 241
Fishes on the Pacific coast..... 248
Fertilizer, Graetzel's*..... 243
Gaseous mixtures, comp. of..... 249
Glucose, grape sugar, corn sirup. 249
Glucose manufacture..... 241
Hittites, the..... 247
Horse collar, steel, improved*.. 243
Ice-making apparatus*..... 246
Industries, American*..... 244
Inventions, agricultural 246
Inventions, engineering..... 246
Inventions, mechanical..... 248
Inventions, miscellaneous..... 243
Island, floating 242
La Plata Mining, etc., Co..... 249
Manufacture, Eng. view of Am. 249
Moss industry in Louisiana . .. 245
Museum of Art, Metropolitan... 240
Napier, John D..... 243
New York Exhibition of 1883.... 241
Notes and queries..... 250
Patent decisions..... 248
Petroleum in Russia 242
Photo-engraving..... 241
Phylloxera pest, the..... 247
Pipe tongs, improved*..... 246
Presses, hand and power*..... 242
Railways of London 249
Sciatica, nerve stretching in 242
Sea worms, edible, the..... 247
Sight for firearms, novel *. 245
Signaling instruction..... 244
Sodawater, home-made 242
Speed regulator, novel*..... 245
Steel, hardened, straightening.. 246
Sugar in sorghum 245
Total solar eclipses..... 248
Trout, when it may be caught.... 248
Type, Farmer, Little & Co*..... 239
Type, manufacture of*..... 239
Vessels, buoying, new method*. 243
Wasp's strategy, a..... 248
Water cresses..... 248
Water system of New York..... 245
Whale, finback, capture of*..... 247
White perch, voice of the..... 249

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 224,
For the Week ending April 17, 1880.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Light Draught Stern Wheel Steam Yacht. 1 illustration. The Mary, U. S. Survey of the Upper Mississippi..... 3559
Small Steam Launch. 1 illustration..... 3559
The Severn Bridge 3559
The Boston Pacific.—The completion of the Atchison, Topeka, and Santa Fe Railway..... 3560
The Guns of the Future 3560
The Fracture of Cast iron..... 3560
Apparatus for Hot Pressing Woven Fabrics. 2 figures..... 3560

II. TECHNOLOGY AND CHEMISTRY.—Malleable Nickel and Cobalt..... 3564
Photography Applied to the Ornamentation of Glasses and Mirrors..... 3564
Leclerc's Process for Silvering Glass..... 3566
The Keeping of Gelatine Emulsion..... 3565
Pearl Inlaying on Iron..... 3565
Still Another Letter-Copying Process..... 3565
Lace Manufacture at Calais..... 3566
On the Artificial Formation of the Diamond By J. B. HANNAY.—Preliminary paper read before the Royal Society, Feb. 26.. 3573
New Process for Electrotyping Non-conducting Materials..... 3574
Analogy Between Fluidity and Galvanic Conductivity 3574
Action of Watery Vapor on Carbon at Different Temperatures. By C. G. DAHLERUS..... 3574

III. ARCHITECTURE, ART, ETC.—The Porosity of Building Materials. An important study of the condition and effects of natural ventilation.—The permeability of different building materials.—Natural stones.—Artificial stones.—Cements.—Woods. 1 figure ... 3561
Mosaic Pavement in Cork Cathedral. 7 figures. Pavement of chancel, Cork Cathedral 3562
Small Conservatories. 1 illustration. A design for a lean-to conservatory. By Mr. NORMAN SHAW, R.A..... 3564
Improved Soil Pipe Ventilator. 3 figures. Boyle's "Air Pump" Ventilator..... 3564
The Statue of Galvani at Bologna. 1 illustration. From a photograph 3566

IV METALLURGY.—Why Does Steel Harden? Continuation of Mr. Metcalf's important investigations (SUPPLEMENT No. 223). Effects of repeated hardening.—Theoretical causes of hardening.—Principles established.—Discussion 3566

V ELECTRICITY, ETC.—Dynamo-Electric Machines. (Continued from No. 223.) The Siemens Machines.—Systems of Herr Frolich, Von Alteneck, Siemens, and Brequet. 13 figures..... 3567
The Electric Light. The Andre lamp..... 3568
Wackermann's Hydrostatic Balance. 1 figure..... 3568
New Luminous Tubes 3568

VI. ASTRONOMY, ETC.—Edmund Halley. His life and work..... 3570
Solar Eclipse of January 11, 1880. Preliminary report of Mr. George Davidson, U S Coast and Geodetic Survey..... 3572

VII. PHYSICS.—A Simple Mercurial Air Pump. By GEO. M. HOPKINS An ingenious method of making an efficient Sprengel-Geissler pump without glass blowing. 10 figures..... 3568
The Theater Praxinoscope. 1 illustration 3570

VIII. MEDICINE AND HYGIENE.—Constipation Viewed as a Disease *per se*, and an exciting cause of disease. By ROBT. BELL, M.D. 3572
Albuminate of Iron.—Its Preparation and Use. By Dr. W. DONITZ 3574
The Hereditary Effect of Extirpation of the Spleen 3574
Burns and Scalds 3574

IX. BIOLOGY, ETC.—Height and Span of the Japanese. An interesting investigation of Japanese physique 3565
The Odor of the Soul.—Dunstmaier's tests of Jager's theory.—The latest phase of "philosophic" craze..... 3576
The Decay of the Emotions..... 3576
The Treatment of Horse's Legs..... 3574
A New Class of Roses..... 3574

THE NATIONAL PLANT OF THE CHINESE.

The uses of the bamboo, says Dr. S. W. Williams (author of "The Middle Kingdom"), are so numerous as to entitle this grass to be called the national plant. It grows naturally throughout the country nearly to the latitude of Pekin, diminishing in size and strength as one goes northward. The varieties induced during the long period of its culture are numerous, and a native writer on its propagation observes at the outset of his treatise that he could not undertake so much as to name them all, and would therefore confine himself to a consideration of sixty three of the principal. Some of them are like trees, forty or fifty feet high, with culms eight inches in diameter at the root; others resemble pipe-stems through their length, graceful and slender as a magician's wand; while one kind presents a black, and another has a bright yellow skin. This plant may well be called useful, for it is applied by the Chinese to such a vast variety of purposes that they are puzzled to get along without it when they emigrate where it does not grow. The tender but tasteless shoots are cut for food, either boiled, pickled, or comfited, as the customer wishes. The seeds, too, furnish a farina suitable for cakes, and the Chinese have a proverb that the bamboo flowers chiefly in years of famine. The gnarled roots are carved into fantastic images of men, birds, monkeys, or monstrous perversions of animated nature; cut into lantern handles or canes, known in commerce as "whangees;" or turned by the lathe into oval sticks for worshipers to divine whether the gods will hear or refuse their petitions.

The tapering culms are used for all purposes to which poles can be applied in carrying, supporting, propelling, and measuring, by the porter, the boatman, and the carpenter in all cases where lightness, strength, and length are requisites. The joists of houses and the ribs of sails, the shafts of spears and the wattles of hurdles, the tubes of aqueducts and the rafters of roofs, the handles of umbrellas and the ribs of fans are all constructed of bamboo. The leaves are sewed upon cords in layers to make rain cloaks, swept into heaps for manure, matted into thatches, and used as wrappers in cooking rice dumplings. Cut into slivers of various sizes, the wood is worked into baskets and trays of every form and fancy, twisted into cables, plaited into awnings over boats, houses, and streets, and woven into mats for the scenery of the theater, the roofs of houses, and the casings of goods. The shavings even are picked into oakum and mixed with those of the rattan, to be stuffed into mattresses. The bamboo furnishes material for the bed and the couch, chop-sticks to use in eating, pipes for smoking, flutes, curtains to hang in the doorway, brooms, screens, stools, coops, stands, sofas, and other articles too numerous to mention, of household necessity and luxury. The mattress to lie on, the chair to sit upon, the table to dine from, the food to eat, and the fuel to cook it with are alike derived from it. The ferule to govern the pupil and the book he studies both originate here. The tapering tubes of the native organ and the dreaded instrument of the lictor, the skewer to pin the hair with, and the hat to screen the head, the paper to write on, the pencil to write with, and the cup to hold the pencils; the rule to measure lengths, the cup to gauge quantities, and the bucket to draw water; the bellows to blow the fire with and the tube to hold the match; the bird cage and the crab net, the life-preserver and the children's buoy, the fishpole and sumpitan, the water-wheel and eaves-trough, sedan, wheelbarrow, and handcart, with scores of machines and utensils, are one and all furnished or completed by this magnificent grass, the graceful beauty of which when growing is comparable to its varied usefulness when cut down.

China could hardly be governed without the constant application of the bamboo, nor could the people carry on their daily pursuits without it. It serves to embellish the garden of the patrician and shade the hamlet of the peasant; it composes the hedge which separates their grounds, assists in constructing tools to work their lands, and feeds the cattle which labor on them. The boatman and weaver find its slender poles indispensable to their trades, while there is nothing the artists paint so well on wares and embroideries. The tabasheer found in the internodes has its uses in native pharmacy, and the silicious cuticle furnishes the engraver a good surface for carving and polishing.

THE METROPOLITAN MUSEUM OF ART.

The new building of the Metropolitan Museum of Art, in Central Park, New York city, was officially declared open to the public March 30. A large number of prominent citizens were present, including President Hayes and the Secretary of State. In accepting the building from the Park Department, the president of the museum spoke of the encouraging beginning that had been made in art collections, and said that the department devoted to industrial art promised to be soon filled. The industrial art schools had made a good beginning and were proving successful. The main address of the occasion was delivered by Joseph H. Choate, on the history and future plans of the museum. Mr. Choate said that the aim of the trustees was not to establish a mere cabinet of curiosities which should serve to kill time for the idle, but gradually to gather together a more or less complete collection of objects illustrative of the history of art in all its branches, from the earliest beginnings to the present time, which should serve not only for the instruction and entertainment of the people, but should also show to the students and artisans of every branch of industry in the high and acknowledged standards of form and of color, what the past had accomplished for them to imitate and excel. It was also a prominent feature of the plan, in which some progress has already been made, to establish a Museum of Industrial Art, as distinct from the beautiful in art, for the direct and practical instruction of artisans, showing the whole progress of development from the raw material, through every artistic process to the most highly wrought product of which art is capable.

The building now open forms one-twelfth of the plan of the grand structure proposed for the museum.

AIDS FOR THE DEAF.

Dr. C. H. Thomas, of Philadelphia, has been making a careful study of audiphones, dentiphones, and other devices for helping the deaf to hear. As stated in a lecture before the Philadelphia County Medical Society, since published in the *Medical Times*, the objects sought in his investigations were:

(1) To demonstrate the principles upon which their action is founded; (2) to determine the practical value and range of use of these instruments; (3) to devise other and more convenient and less conspicuous forms of mechanism which might be substituted for them; (4) to improve the quality and increase the volume of the sound conveyed; (5) to discover new physiological and pathological facts relating to the functions of vocalization and hearing; and (6) to throw open to professional, and so to public, use the results gained, thus supplying data for further investigation and invention.

It appeared that both the audiphone and dentiphone depend for their action upon the principle of acoustics that solids—in this case in the form of thin plates—vibrate in unison with the sound waves produced in the air near them. In these instruments the vibrations are of sufficient force to be audible when conveyed to the internal ear through the medium of the teeth and cranial bones, independently of the ordinary channel of hearing—the transmission being direct in the audiphone and indirect through the conducting string in the dentiphone. In the audiphone not tension but the arched form is the condition essential to its proper action, for this form is that best adapted to impart the impact of sound waves against its convexity, which is then expended as thrust of the arch against the teeth, these forming one of its abutments.

To do away with conspicuousness and inconvenience of these instruments, Dr. Thomas made one in which the large receiving diaphragm was attached to a curved rod of wood or metal, like a pipe-stem. In this way the diaphragm was supported below the level of the face by the curved stem held firmly between the teeth, allowing the user to have his hands free and his face uncovered. In experimenting with different materials for diaphragms it was found that when substances lacking in resonance were used (such as celluloid and binder's board) flatness of tone resulted. Substances, which were over-resonant or over-persistent in their vibrations (as vulcanite and ferrotype metal) yielded ringing or confused sounds. The quality needed is that possessed by good sounding boards, of instantly responding to contiguous sounds and maintaining them during their continuance, and also of instantly ceasing to vibrate upon the cessation of the causative sound. This right sort of elasticity of resonance, that capable of reproducing human voice tones in their purity, is possessed to a high degree by fuller's board (or press-board), which, when treated with shellac varnish and thoroughly dried, has proved not only far better than other paper or cardboards, but is also a great improvement upon the sheet metals or hard rubber, lacking the "reverberations" and "roaring sounds" of the latter, as they are described by different patients upon whom they have been tested. Besides, owing to its greater elasticity, it is less destructible than either these or the thin sheets of wood which otherwise answered the purpose, while its cost is but trivial.

The simplest instrument, one that excels either the audiphone or the dentiphone in the volume of sound transmitted, consists simply of a small rod of hard wood—a convenient size being about two feet long and a quarter of an inch thick—one end of which is placed against the teeth of the speaker, the other resting against or between the teeth of the person hard of hearing. If the speaker now articulates in a natural tone of voice, the vocal vibrations will be transmitted in great volume through the teeth and thence to the ears of the deaf person.

Later observations show that it will also convey the voice distinctly when placed against the forehead or other portions of the skull of the hearer. It will also convey perfectly audible speech from the skull of one to that of the other, or in its absence such sounds may be conveyed by simply bringing the heads themselves in contact. Again, instead of the speaker holding it against his teeth, he may place it against the upper part of his chest, when, upon using his voice, the sound will be conveyed as before, of course independently of the teeth of either person.

That these instruments are of great value in a considerable proportion of cases of deafness, Dr. Thomas thinks there is no reason to doubt, but there is, in his opinion, no just ground for the public belief that with their aid the deaf are enabled to hear as well as those with ordinary hearing. On the contrary, they supply but a very small fraction of normal hearing—much *less* than a *hundredth part*. The difference between normal hearing and that derived through these means is hardly less marked than that between sunlight and candle-light; nevertheless, this very small fraction is a priceless value in many cases, for to those who practically hear nothing without them, who sit in acoustic darkness, the gain

© 1880 SCIENTIFIC AMERICAN, INC

is all the difference between nothing and something—scarcely less than infinity.

In view of certain strongly expressed statements which have obtained currency, the results to be derived from the use of the audiphone in deaf-mutism are likely to prove very disappointing. Repeated tests show that those who are able to hear with the aid of the audiphone hear *their own voices* perfectly without it; while those who are unable to hear their own voices without it can hear no other voice with it.

SOME ELECTRICAL MEASUREMENTS OF ONE OF MR. EDISON'S HORSESHOE LAMPS.

BY HENRY MORTON, PH.D., ALFRED M. MAYER, PH.D., AND B. F. THOMAS, A.M., AT THE STEVENS INSTITUTE OF TECHNOLOGY.

Much has been written and said within the last few months on the subject of Mr. Edison's new horseshoe lamps, and with all the writing and saying there has been wonderfully little produced in the way of precise and reliable statement concerning the simple primary facts, a knowledge of which would give the means of estimating both the scientific and commercial status of this widely discussed invention.

It was, therefore, with great pleasure that the present writers found themselves, through the kindness of the SCIENTIFIC AMERICAN, placed in possession of one of these horseshoe lamps of recent construction.

To satisfy themselves as to the real facts of the case they soon made a series of careful measurements and determinations, and as the results of these are likely to interest others, they now put them in print for general benefit.

A further examination of other lamps would have been made at the same time had opportunity offered; but as a communication on this subject addressed to Mr. Edison did not evoke a reply, they are obliged to content themselves with the one lamp as a subject of experiment.

They would, however, here remark that the behavior of this lamp, under the tests, and the agreement of its results with information otherwise obtained, convince them that it is at least a fair specimen of the lamps of this form so far produced at Menlo Park.

The first object, on receiving the lamp, was to determine roughly what amount and character of electric current would be needed to operate it efficiently. With this view a number of cells of a small Grove's battery were set up, having each an active zinc surface of twenty square inches and a platinum surface of eighteen square inches.

The lamp being placed in the situation usually occupied by the standard burner in a Sugg's photometer, the battery was, cell by cell, thrown into circuit.

When ten cells had been introduced the horseshoe showed a dull red, with fifteen cells a bright red, with thirty-four cells the light of 1 candle was given, with forty cells the light of 4½ candles, and with forty-five cells the light of 9⅕ candles, and with forty-eight cells 16 candles.

Having thus determined what amount of electric current would be required for experiments, arrangements were made to measure accurately the resistance of horseshoe while in actual use and emitting different amounts of light. The resistance of this carbon thread at the ordinary temperature had been already determined as 123 ohms in the usual way, but it was presumed, as had been shown by Matthiessen (*Phil. Mag.*, xvi., 1858, pp. 220, 221), that this resistance would diminish with rise of temperature.

To measure the resistance under these circumstances the apparatus was arranged as follows: The current from the battery was divided into two branches, which traversed, in opposite directions, the two equal coils of a differential galvanometer. One branch then traversed the lamp, while the other passed through a set of adjustable resistances composed of German-silver wires stretched in the free air of the laboratory, to avoid heating. (Careful tests of these resistances showed that no sensible heating occurred under these circumstances.)

Matters being thus arranged, the resistances were adjusted until the galvanometer showed no deflection when the candle power of the lamp was taken repeatedly in the photometer, and the amount of resistance was noted.

These measurements were several times repeated, shifting the coils of the galvanometer and reversing the direction of the current.

The results so obtained were as follows:

Resistances.	Condition of Loop.
123 ohms.....	Cold.
94 "	Orange light.
83·7 "	$\frac{9}{10}$ candle.
79·8 "	5 "
75 "	18 "

The photometric measurement was in all these cases taken with the carbon loop at right angles to the axis of the photometer, which was, of course, much in favor of the electric lamp. On turning the lamp round so as to bring the carbon loop with its plane parallel with the axis of the photometer, *i. e.*, the edge of the loop turned toward the photometer disk, the light was greatly diminished, so that it was reduced to almost one-third of what it was with the loop sideways to the photometer disk.

Having thus determined the resistance of the lamp when in actual use, it was next desirable to measure the quantity of the current flowing under the same conditions.

To do this the current from fifty cells of battery was passed through a tangent galvanometer as a mere check or indicator of variations, and then through a copper voltameter, *i. e.*, a jar containing solution of cupric sulphates with copper electrodes immersed, and then through the lamp, placed in the photometer.

Under these conditions it was found that during an hour the light gradually varied from about 16 candles at the beginning to about 14 candles at the end, making an average of about 15 candles, measured with side loop of toward disk.

The galvanometer during this time only showed a fall of half a degree in the deflection of the needle.

Carefully drying and weighing the copper electrodes, it was found that one had lost 1·0624 grammes.

Now, it is well known that a current of one weber takes up 0·00326 gramme of copper per second, which would make 1·1736 grammes in an hour; therefore the current in the present case must have been on the average $\frac{1{\cdot}0624}{1.1736} = 0{\cdot}905$ webers, or a little less than one weber.

Having thus obtained the resistance of the lamp when emitting a light of 15 candles, namely, 76 ohms, and the amount of current passing under the same conditions, namely, 0·905 weber, we have all the experimental data required for the determination of the energy transformed or expended in the lamp, expressed in foot pounds. For this we multiply together the square of the current, the resistance, the constant 0·737335 (which expresses the fraction of a foot pound involved in a current of one weber traversing a resistance of one ohm for one second), and the number of seconds in a minute. Thus, in the present case, we have $0{\cdot}905^2 = 0{\cdot}8125$, and $0{\cdot}8125 \times 76 \times 0{\cdot}737335 \times 60 = 2753{\cdot}76$ foot pounds.

Dividing these foot pounds per minute by the number of foot pounds per minute in a horse power, that is, 33,000, we have 0·08, that is, about eight one-hundredths or one-twelfth of a horse power as the energy expended in each lamp.

It would thus appear that wtth such lamps as this, one horse power of energy in the current would operate 12 lamps of the same resistance with an average candle power of 10 candles each,* or 120 candles in the aggregate.

Assuming that a Siemens or Brush machine were employed to generate the electric current, such a current would be obtained, as has been shown by numerous experiments, with a loss of about 40 per cent of the mechanical energy applied to the driving pulley of the machine. To operate these 12 lamps, therefore, we should have to apply more than one horse power to the pulley of the machine, so that when this loss in transformation had been encountered there should be one horse power of electric energy produced. This would call for 1⅔ horse power applied to the pulley of the dynamo-electric machine, by the steam engine.

To produce one horse power in a steam engine of the best construction about three pounds of coal per hour must be burned, and therefore for 1⅔ horse power 5 lb. of coal must be burned.

On the other hand one pound of gas coal will produce 5 cubic feet of gas, and will leave, besides, a large part of its weight in coke, to say nothing of other "residuals," which will represent practically about the difference in value between "steam making" and "gas making coal," so that it will not be unfair to take 5 lb. of gas coal as the equivalent of 5 lb. of steam coal.

These 5 lb. of gas coal will then yield 25 cubic feet of gas, which, if burned in five gas burners of the best construction, will give from 20 to 22 candles each, or 100 to 110 candles in the aggregate.

We have, then, the twelve Edison lamps producing 120 candles and the five gas burners producing 100 to 110 candles, with an equivalent expenditure of fuel.

If each apparatus and system could be worked with equal facility and economy, this would of course show *something* in favor of the electric light; but when in fact everything in this regard is against the electric light, which demands vastly more machinery, and that of a more delicate kind, requires more skillful management, shows more liability to disarrangement and waste, and presents an utter lack of the storage capacity which secures such a vast efficiency, convenience, and economy in gas, then we see that this relatively trifling economy disappears or ceases to have any controlling importance in the practical relations of the subject.

*The candle power being 15 candles in the best position, and 5 candles at right angles to this, the average or general illuminating power of the lamp is 10 candles.

THE AMERICAN FISH CULTURAL ASSOCIATION.

The ninth annual meeting of the American Fish Cultural Association began in this city Marc' 30. A large number of gentlemen interested in fish and fishing were present. The President, Mr. R. B. Roosevelt, read an interesting paper on hybrids. Mr. Seth Green contributed an account of his experience with California mountain trout, brook trout, and black bass at the State hatchery, with remarks on cray-fish and frogs.

Mr. Hugh D. McGovern submitted a short paper on the discovery made by him of a curious habit of eels. At the Brooklyn waterworks, among the wet moss growing on the crown of an arch over a waterway, 12 inches above the surface of the water, he found thousands of small eels, who seemed to live there, clinging to the moss as flies cling to the ceiling. The fact was important, as showing how this fish could move from water to water. To reach the moss these eels must have climbed up the 12 inches of wet wall above the surface of the water.

Mr. Livingston Stone, U. S. Assistant Commissioner of Fisheries, followed with an important paper on the transportation of live fish. Mr. James Annin gave an illustration of trout stripping in artificial propagation, using a number of male and female trout from his ponds on Long Island. Mr. Charles Hallock gave a description of Labrador fishing, and Mr G. Lamphear read a short but valuable paper comparing the statistics of Fulton Fish Market for 1878 and 1879. His figures showed that 34,276,666 pounds of fish were sold in Fulton Market during the year 1879–'80, an increase of 646,700 pounds over the previous year. In addition, 1,509,561 mackerel had been sold and 291,845 shad.

The next day Prof. Brooks, of Johns Hopkins University, described the propagation of the oyster; and Prof. Atwater, of Wesleyan College, read a paper on the nutritive qualities of various kinds of fish. Prof. Brooks believes that the oysters of the Chesapeake do not breed in the same way as European oysters do; that the sexes are separate; and that to propagate oysters artificially the males and females should be chopped up together and thrown into the water, so as to thoroughly mix the eggs and milt.

In this way, he thinks, the oyster might be propagated with profit, using for the purpose small ponds. All this learned trifling will be very amusing to the practical oystermen of Connecticut, who, for a score of years, have successfully propagated oysters by the square mile. Their trouble is not to get an abundance of young oysters. At certain easily recognized times the Sound waters swarm with them, ready to attach themselves to any clean "stools" presented to them. The real trouble is to defend the oyster farmer's acres of partially grown oysters from the swarms of star-fish and other marine vermin which prey upon them; for which defensive work steam dredging seems to be the only economical and certain resource.

PHOTO-ENGRAVING.

In general terms the process of producing engravings or types for printing by photography, consists, first, in making a sharp negative of the picture to be engraved; second, in the photographic printing of a sheet of sensitized gelatine by means of the negative; third, the development of the printed lines upon the surface of the gelatine by water; and fourth, the casting of a copy of the developed gelatine sheet in metal, the metal so produced being used for printing on the press in the ordinary manner. All this is very simple, and in the hands of experienced and skilled persons very beautiful examples of printing plates, having all the fineness and artistic effect of superior hand engraved work, may be produced.

Among the earliest and most extensive efforts to introduce this process commercially were those of Mr. John C. Moss, of this city, to whose persevering labors the public is chiefly indebted for the successful establishment of the new industry in this country.

Mr. Moss has finally concluded to give the public the benefits of all his latest improvements in this line, by the organization of a new corporation known as "The Moss Engraving Company," whose first announcement will be found in our advertising columns. Every description of engraving and printing plates is done in a superior manner by the company promptly on very moderate terms. The Moss process has been used on the SCIENTIFIC AMERICAN, especially on our SUPPLEMENT, for several years past, and we therefore speak from experimental knowledge when we say that it is good and reliable. The motto of Mr. Moss's company is "The best work at low prices, always on time." In all our past experience with Mr. Moss, although we have given him many perplexing jobs, we have never known him to fail in carrying out the above motto. The Moss Engraving Company has a large and splendid establishment at 435 Pearl St., New York, which is fitted up in every department with the latest and best appliances for the execution of good work. It deserves and will doubtless command an extensive patronage.

THE NEW YORK EXHIBITION OF 1883.

A bill to provide for celebrating the one hundredth anniversary of the treaty of peace and the recognition of American independence by holding an International Exhibition of arts, manufactures, etc., in New York, in 1883, passed the Senate March 31. It incorporates the United States International Exhibition, composed of well known New York gentlemen, whose official functions are to continue until the close of the Exhibition. It will be their duty to fix the date of the Exhibition, make the needed preparations for it on a site within the corporate limits of the city of New York, and to superintend the Exhibition during its progress. The bill provides further that the corporation shall cease to exist on or before January 1, 1885. Congress may at any time alter or repeal the act, and the United States are not to be liable for any of the acts or representations of the promoters of the enterprise. Not less than $1,000,000 must be subscribed, and not less than 10 per centum thereof must be paid in before the corporation may do any corporate act other than organize, and no part of the capital stock or assets is to be withdrawn, refunded, or divided among the stockholders until all the debts are fully discharged.

Glucose Manufacture.

There appears to be quite a furor in the West in connection with the manufacture of glucose from corn. A large number of factories are being set up; one at Chicago, it is said, will have a capacity of 20,000 bushels a day. A bushel of corn produces 30 pounds of glucose (grape sugar) or 3 gallons of sirup. The sugar costs 2 cents a pound, the corn selling at 40 cents a bushel.

© 1880 SCIENTIFIC AMERICAN, INC

Artificial Atropine.

Up to the present time the artificial preparation of an alkaloid has not been successfully carried out. Vanilline and other organic products formed in plants have been made, and a substance isomeric with coniine was also made some years since. Ladenburg has recently taken an important step in the matter of making artificial atropine. He has, in fact, prepared the alkaloid, but the materials employed in its preparation, namely, tropine and tropic acid, have not yet been obtained from any other source than from atropine. When atropine is acted upon by baryta or hydrochloric acid, it breaks up into tropic acid and tropine. To be able to unite these two bodies again, so as to form the true atropine, may seem a small affair, and yet it is often very difficult. Every one knows how grape sugar splits up into alcohol and carbonic acid, if yeast is present, yet no one has ever been able to convert alcohol into sugar by acting upon it with carbonic acid. The conversion of cane sugar into glucose is easy enough, and yet the opposite is impossible. The destruction of complex organic compounds is always easier than their production, and whenever we succeed in rebuilding a body from simpler ones we have made an important step in the direction of its synthesis. To decompose the tropic acid into simpler bodies, perhaps into substances that have already been prepared, and then to reverse the operation, will be the next duty of Dr. Ladenburg.

Atropine is the active constituent of belladonna, and possesses, with other properties, the remarkable power of dilating the pupil of the eye, whether introduced into the eye, taken into the stomach, or injected beneath the skin.

The artificial atropine prepared by Ladenburg has the same effect upon the eye. Both the natural and the artificial alkaloids possess the power of neutralizing the action of muscarine upon the heart. Physically they have the same melting points, and both crystallize in brilliant needles. The precipitates formed by tannin, mercurio-potassic iodide, picric acid, chloride of gold, etc., have the same properties whether the natural or artificial atropine is employed. When heated with sulphuric acid and bichromate of potassium they each evolve an odor of benzoin. These remarkable physical and chemical coincidences leave no reasonable doubt of their identity.

The Effect of Coffee Again.

Dr. Richardson, the eminent English scientist, in respect to the popular notion that coffee is an unhealthy beverage, that it keeps up a constant irritation of the stomach, and brings on depression of spirits, etc. There was a great deal of truth in that statement, says the doctor, as coffee cannot be taken in excess without producing dyspepsia and irritation, *but moderately used it is an invigorating, healthful, and wholesome drink, bringing a man's best energies into play.* The quantity taken, however, must not be large, and should be good.

Dr. Bock, of Leipsic, another celebrated scientist, says: "The nervousness and peevishness of our times are chiefly attributable to tea and coffee: the digestive organs of confirmed coffee drinkers are in a state of chronic derangement, which reacts on the brain, producing fretful and lachrymose moods. Fine ladies addicted to strong coffee have a characteristic temper, which I might describe as a mania for acting the persecuted saint. Cocoa and chocolate is neutral in its psychic effects, and is really the most harmless of our fashionable drinks."

Nerve Stretching in Obstinate Sciatica.

At a recent meeting of the Harveian Society, London, Mr. Pye read a paper on nerve stretching. A patient had suffered for many years with severe sciatica, for the treatment of which huge doses of morphia had been used. The patient was in severe pain when not under the influence of morphia. The nerve having been laid bare, it was pulled backward and forward, forcibly, with from eight to ten pounds pressure. The wound healed well, the pain was lost, and some paresis followed. The paresis wore off, and some pain was felt in the lower leg, but there was no return of the sciatica. The patient was able to resume work. The sciatica was probably rheumatic. The list of cases of nerve stretching yet performed is not large enough to settle the question of the justifiableness of the operation. Mr. Pye then reviewed very carefully the history of the operation. It has been less successful in the treatment of tetanus than neuralgia. When the nerve was compressed by an inflammatory area the operation promised well. In cases where the skin had become altered a change toward the normal condition followed, as well as the relief of pain.

Petroleum in Russia.

From an official report addressed by Colonel Romanowsky to the Russian Minister of Finance, it appears that the principal petroleum depots in the Russian Empire are to be found in the southeastern and northeastern districts of the Caucasus, that is to say, in the province of Bakou, on the shores of the Caspian Sea, and in the province of Kouban, in the vicinity of the Black Sea. According to the statements of some Russian engineers, there are no less than 250 localities within these provinces where enormous quantities of petroleum can be found. It is said that 100 of these depots, if properly worked, could be made to yield 660,000,000 gallons per annum. The Bakou oil is thick and heavy, suitable for heating and for rough purposes in general; the Kouban oil is of better quality for refining and for burning in lamps.

IMPROVED HAND AND POWER PRESSES.

We give on this page engravings of several varieties of presses made by the Boomer & Boschert Press Company of Syracuse, N. Y. These presses are adapted to a great range of work, such as baling cloth, pressing paper, expressing lard or tallow, making cider, wine, etc., and are built in different sizes to be operated by hand or power.

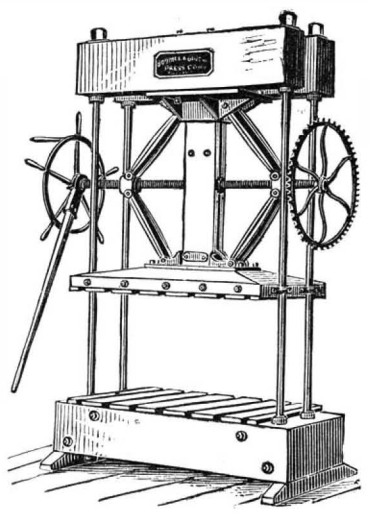


Fig. 1.—CLOTH BALING PRESS.

An almost endless number of devices have been used for obtaining pressure, the most prominent being the screw, the lever, and the hydraulic press, but these without exception give the same power at the beginning and end of the work.

In expressing lard and tallow or the different oils, as well as most other substances, but little power is required in the early part of the operation, and the constantly increasing resistance requires a corresponding increase of power. The construction of the Boomer & Boschert press is such as to insure a regular increase of power with every turn of the screw which tends to straighten the toggles, while the movement of the follower is proportionately less. The development of pressure and increase of resistance are so nearly equal that the same power that is applied at the beginning of the pressing operation is competent to finish. For example: one man with a hand power press can easily perform the task from beginning to end. This "progressive power," as the manufacturers term it, is perfectly adapted to the work, and by very simple means accomplishes wonderful results.

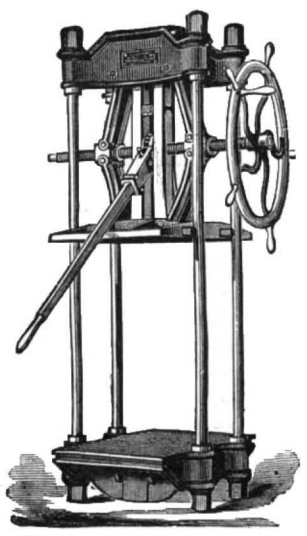


Fig. 2.—PAPER PRESS.

Fig. 1 shows a cloth baling press embodying this principle. The platen is guided by the rods which bind the upper cross beams to the bed and take the strain of the press. The frame and platen of this press are wood, and may be varied in size within certain limits without materially affecting the cost.

The paper press shown in Fig. 2 is made of iron in different sizes. The length of the rods controls the distance between the base and follower and the capacity of the regular sizes of this press may be varied by using longer or shorter rods.

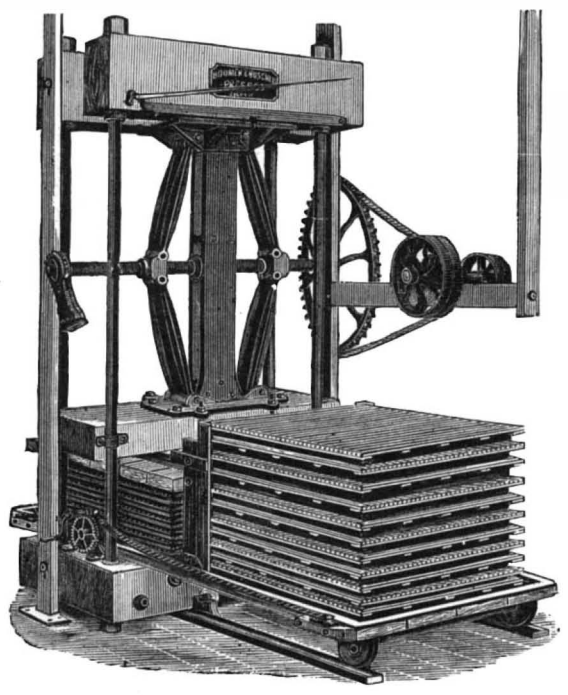


Fig. 3. POWER CIDER PRESS

The power cider press represented in Fig. 3 has a double platform, which is mounted on a truck, movable on a track on the floor. The shifting gear is worked by a crank, and is arranged to move the platform across the bed of the press easily and quickly. By means of this arrangement one cheese may be pressed while another is being made ready.

In this connection we give an engraving of Messrs. Boomer & Boschert's apple grater, which is very efficient and well adapted to the work it is required to perform.

The frame of the grater is made of iron, giving a security, strength, and stability which no wood frame, however well made, possesses. The cylinder is of iron, turned and carefully balanced. It has planed grooves to receive the knives —eight in number—which are adjustable by set screws, above and below at each end, and held firmly in their places by a heavy wrought iron band shrunk on each end of the cylinder

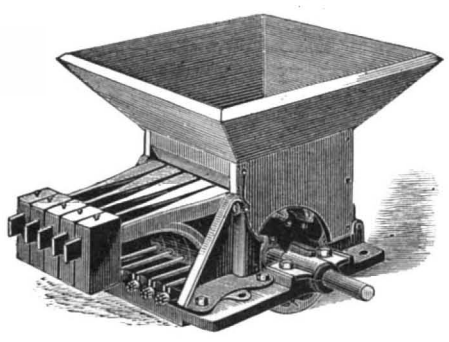


Fig. 4.—APPLE GRATER.

The concaves consist of five iron levers with movable weights, allowing stones or any other hard substances to pass through without injury to the knives.

Fig. 5 shows a press made on the same principle as the others and especially designed for kettle rendered scrap. It is provided with an improved hoop consisting of a cast iron section or post, which forms about one sixth of the hoop, is firmly bolted to the bed of the press, and arranged with hinges upon which swing two doors that complete the circle when fastened together. These doors are constructed of wrought iron hoops and staves, with steel fastenings.

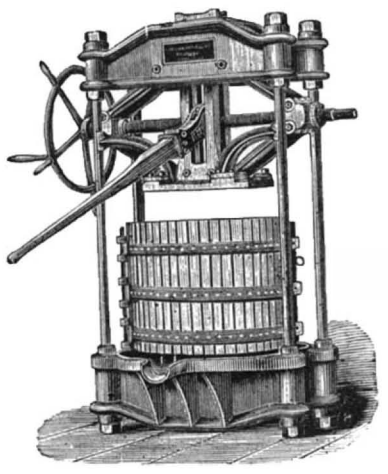


Fig. 5.—LARD PRESS.

When the pressing is completed, the doors are unfastened and swung open, the cake is removed, the doors are swung together and again fastened, thus avoiding much of the heavy lifting attending the use of other kinds of hoops.

These presses have been extensively introduced in the principal cities of this country—as well as Europe, South America, Mexico, and to some extent in Asia, and are deserving of the success they have attained.

Floating Island.

Among the many natural curiosities of Tuolumne county it is not generally known that there is a "floating island." Up in the "Siskiyous," lying like a pearl in the great mountain chain, is Squaw lake, a beautiful sheet of water, now utilized by a mining company as a reservoir. For many years the lake has been a favorite and delightful resort for fishing parties, and contained nearly in its center an island, comprising about an acre of ground, covered with luxuriant grass and a growth of willow and alder. It was never dreamed that the pretty little island was not terra firma, but when the bulkhead across the outlet of the lake dammed up its waters, the island rose slowly until it had been elevated fully 16 feet above its original level. It would be a question for the naturalist rather than the geologist to determine the age of this floating island, as it is evidently made up entirely of decayed vegetation. Perhaps at some remote period the roots of a tree, uptorn by the mountain storm, drifting out in the lake, formed the nucleus from which the island has grown, but it seems singular that it should have remained anchored and unchangeable in its position. The locality is much frequented by pleasure seekers who will hereafter notice the increased elevation.—*Jacksonville Sentinel.*

Home Made Soda Water.

The artificial seltzer water, made with a carbonic acid generator, is already an imitation, far from perfect, of the natural water. A receipt to make it on the small scale for family use, as it were, can only give a product differing still more from that of the spring. Yet the following would fairly imitate the taste and properties of the natural water:

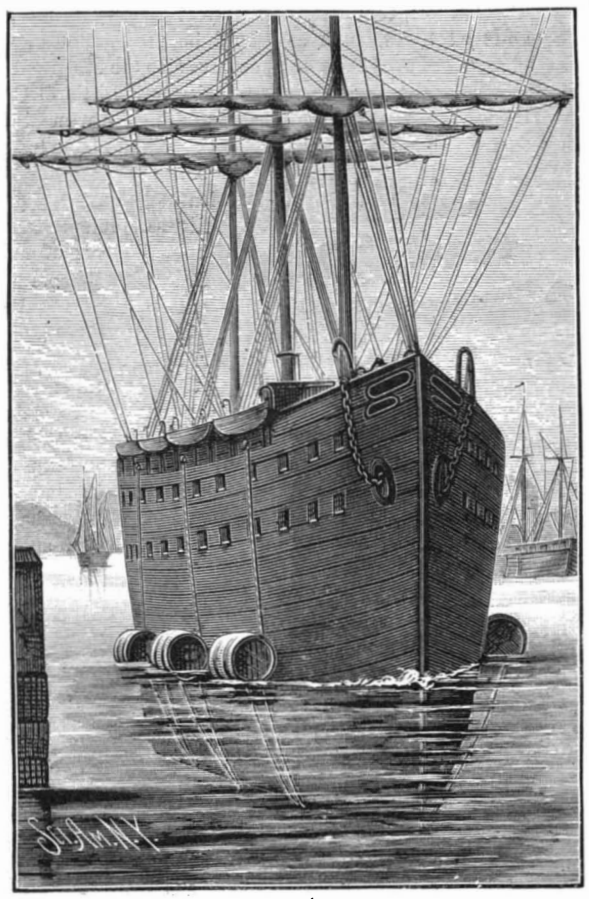
Fused chloride of calcium	4 grains.
Chloride of magnesium	12 "
Chloride of sodium	15 "
Citrate of iron	½ "
Tartaric acid	2 drachms.
Bicarbonate of soda	2½ "
Water sufficient.	

Dissolve all the salts, excepting the tartaric acid and the bicarbonate, in about one pint of water, and introduce the solution into a champagne bottle. Then, having completed the requisite quantity of liquid so as to leave an empty space of about two fluid ounces, add the tartaric acid, and, immediately after, the bicarbonate of soda. Cork the bottle tightly, secure the cork with stout cord, and set the bottle aside for about six hours before it is opened. It is then ready for use.

© 1880 SCIENTIFIC AMERICAN, INC

NEW METHOD OF BUOYING VESSELS.

The annexed engraving represents a novel method of preventing the careening or rolling of vessels while discharging in port. Ordinarily vessels without ballast are supported by spars or logs; this improved method consists in attaching a line to airtight casks floating on the water at the sides of the vessel, and passing a line from each cask under the keel and up the opposite side of the vessel, where it is made fast. The casks employed for this purpose may be the ordinary water casks carried by all vessels. If one cask on each side is insufficient to produce the desired result two or more may be used. By this arrangement the least inclination of a vessel to roll is checked, and the cargo may be discharged without fear of careening.



WHEEDEN'S METHOD OF BUOYING VESSELS.

This device is adapted to pontoon bridges, floating docks, and may be applied to great advantage to disabled and leaky vessels at sea.

Further information may be obtained from the patentee, Mr. James C. Wheeden, 97 South Broadway, Baltimore, Md.

NEW CHECK-ROW, CORN PLANTER, AND FERTILIZER.

The machine shown in the annexed engraving is designed for planting corn in perfect check-row, so that the rows will be straight each way, and for delivering a limited amount of fertilizer to each hill.

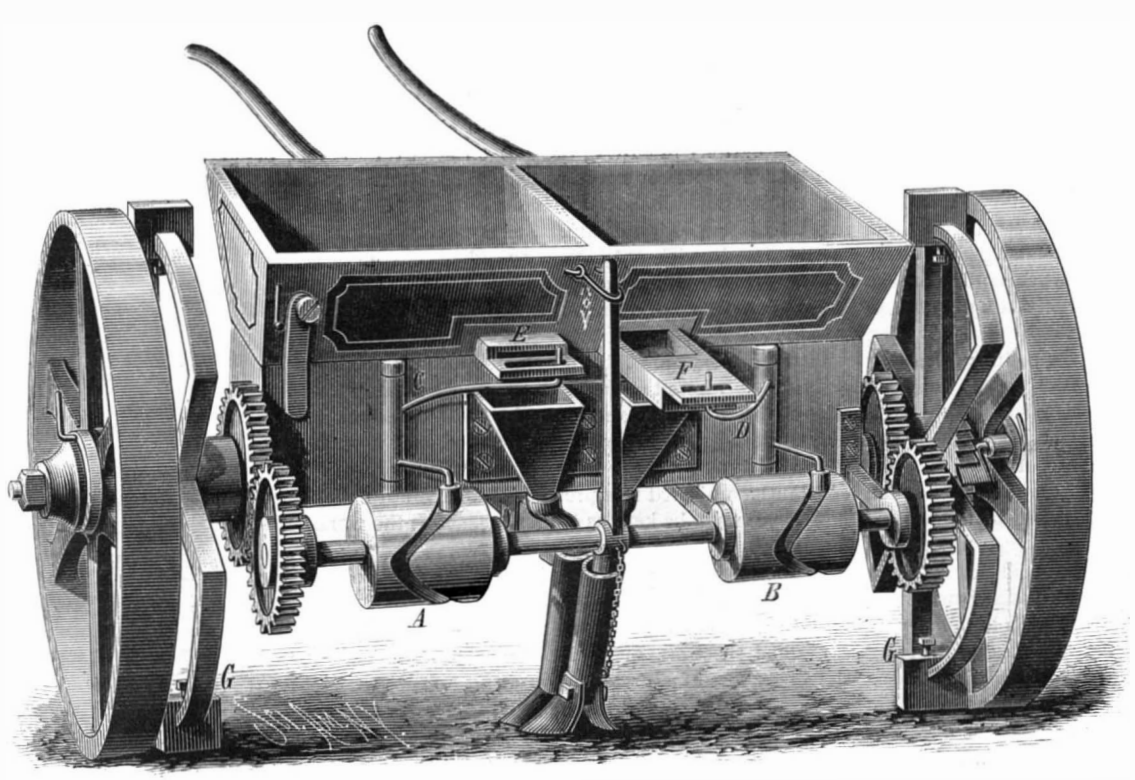
The running wheels and the markers, G, are mounted on a sleeve placed on a shaft which runs through the lower portion of the body of the planter. The markers, G, consist of three segments connected with a central hub, and having arc-shaped bars concentric with the running wheels and provided with feet or markers which, by indenting the ground, make an impression that serves as a guide for dropping the next row. As the relative position of these markers may at times require changing, they are connected with the arc shaped bars by clamp plates and bolts so they may be readily fastened at any desired point.

On the outer sides of the hubs of the markers there are ratchet wheels which are engaged by pawls carried by the running wheels, and the inner sides of the marker hubs carry spur wheels for driving the seeding and fertilizing devices. The pawls which carry the markers are provided with handles for easily operating them from the outside of the running wheels, and they are held either in gear or out of gear by a double-acting spring.

A shaft carrying two grooved zigzag cams, A B, is journaled in supports projecting from the rear of the body of the planter, and is provided with spur wheels at each end which take motion from the wheels on the marker hubs. The cams, A B, are arranged to oscillate the rock shafts, C D, which, in turn, operate the feed slides, E F, which are so arranged as to drop seed and fertilizer into their respective hoppers, E being the seed slide, and F the fertilizer slide. In the seed slide there is the customary space for the reception of a few grains of corn which are to be dropped. This little chamber is pulled through the side of the seed box and allowed to drop into the hopper communicating with the spout by a flexible tube. To prevent the corn from becoming packed in the slide, the seed box is made with an expanding opening, which expands and allows the grain to pass without mashing it. The slide, F, is made adjustable so as to vary the quantity of fertilizer dropped with the seed. The grain spout and the fertilizer spout are connected together with the grain spout in advance, and they terminate in a plow or opener, behind which there are coverers.

The engraving shows the planter in its simplest form, adapted to a single row of corn, but it is obvious that a machine may be constructed on the principle to plant a number of rows simultaneously.

Further particulars in regard to this invention may be obtained from the patentee, Mr. H. F. Graetzel, of St. Joseph, Md.



GRAETZEL'S CHECK-ROW CORN PLANTER AND FERTILIZER.

John D. Napier.

Mr. John D. Napier, of the well known firm of Napier Brothers, manufacturing engineers, Glasgow, Scotland, died Friday, March 12. Mr. Napier was trained as an engineer by his father, the late David Napier, the pioneer of deep sea steam navigation in Great Britain. In early life he took a prominent position among the practical engineers of London. Subsequently he spent a number of years in Australia; but for a considerable period he had resided in Glasgow, ranking high among the leading mechanical engineers of his day.

Illiterate Collegians.

Mr. Charles Dudley Warner says, in the *Christian Union*, that he was told not long ago, by a professor in one of our leading colleges, that a freshman came to him, after he had been recommending certain books in the literature class, and said he had never read a book in his life. This was literally true. Except his text-books, he had never read a book; he had passed a fair examination, but of reading he knew no more than a Kaffir. Another professor in another college, also one of the highest in the country (both of these are Eastern colleges, in the center of the best culture in America) told Mr. Warner more recently that a sophomore, who stood well in his class, came to ask him where he obtained certain facts which he referred to in the class room. It came out that the young man never had read a book, didn't know what the sensation was, or how to set about it, and had not the faintest conception of literature. He had no notion of the pleasure or profit to be got from reading; the world of books was absolutely beyond his imagination, and he could not conceive what people found in it. The professor at length induced him to read one of Scott's novels, but the boy found it a very tedious and uninteresting occupation.

These two instances Mr. Warner thinks extreme only in degree, and insists that it is a common thing for undergraduates to be ignorant of everything but their text-books. There is a popular prejudice that young men who have been graduated at college are "liberally educated," and that no one else can aspire to that honorable title. Yet it is a common thing for untaught mechanics, used to reading good books and a paper like the SCIENTIFIC AMERICAN, to have vastly more real learning, and that of a more useful kind, than the average collegian carries away from college.

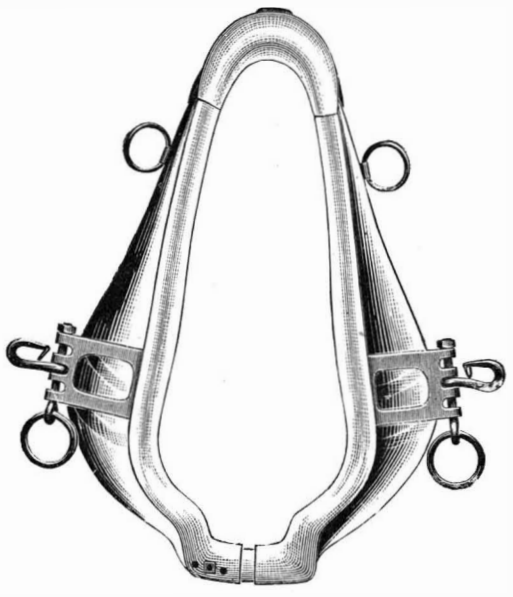
IMPROVED STEEL HORSE COLLAR.

We give herewith an engraving of an improved steel horse collar recently patented in the United States, Canada, Great Britain, France, Belgium, and Germany by Messrs. Fisher & Watson, and is being manufactured and introduced by Mr. R. Carter, of Brooklyn, N. Y.

This collar is swaged out of thin plates of steel, and is light, strong, and low priced.

A great difficulty has been encountered in attempting to provide metallic collars with suitable couplings or fastenings, which will not only connect the two halves or flanged sections of the same with the requisite security and rigidity, but also permit convenient adjustment, for the purpose of enlarging or diminishing the capacity of the collars, so as to adapt them for use on horses of different sizes, or on the same animals under different conditions. After many experiments Messrs. Fisher & Watson have succeeded in producing a flanged metallic collar whose fastenings are of such a character as to permit easy and quick adjustment for varying width or length without weakening the connection and lessening the rigidity of the collar, and are at the same time light, compact, and durable.

With this collar no hames are required, as the traces are connected directly with the collar. It is perfectly smooth



STEEL HAMELESS HORSE COLLAR.

and hard, absorbing no perspiration, and cooling the shoulders by the hollow conformation, always exposed to the air; fitting closely to the neck and shoulders, all lateral motion is prevented, as well as any folding or creasing of the skin so often caused by the stretched or loose lining of the padded collar; it will never gall, and upon sore shoulders will exercise the same healing properties as the well-known zinc pad. Further information may be obtained in relation to this invention by addressing Mr. R. Carter, 305 Quincy street, Brooklyn, N. Y.

MISCELLANEOUS INVENTIONS.

Mr. Ebnezar H. Sturges, of Wing's Station, N. Y., has patented a compact and convenient safe or receptacle for receiving and keeping housekeeping utensils conveniently and handy for use. It consists in a safe having compartments for knives, bottles, sugar, spices, and other articles.

Mr. Max Rubin, of New York city, has patented a bottle stopper provided with a discharge spout, and so constructed that the spout may be covered and uncovered by closing and opening the stoppers.

An improved store counter has recently been patented by Mr. Henry H. Henderson, of New Glasgow, Nova Scotia. The invention relates to means for supporting the hinged covers of the sections; and it consists in two jointed bars or rods, one pivoted on the inside and the other provided with an eye that slides on a keeper attached to the under side of the cover, in combination with a notched cam on the inside of one end of the section, so that the pivoted rod catches behind the shoulder when the cover is opened and holds it firmly in position.

Mr. John D. Richardson, Jr., of Newport, R. I., has patented an improved electric call bell. The object of the invention is to permit the operation from the central station of any one bell in the circuit, whereby one station may be called without giving an alarm at any of the others.

© 1880 SCIENTIFIC AMERICAN, INC

AMERICAN INDUSTRIES, No. 39.

THE MANUFACTURE OF PRINTER'S TYPE.

As there are nearly 8,000 newspapers in the United States, and probably twice as many printing offices for the production of every class of work from a merchant's card or letter head to a cyclopædia, it follows that the business of type-founding must be one of considerable magnitude. At first it was only a branch of the printer's trade, but it early developed into an essentially distinct business. Now a printer would no more think of making his own types than a tailor of weaving the cloth he cuts.

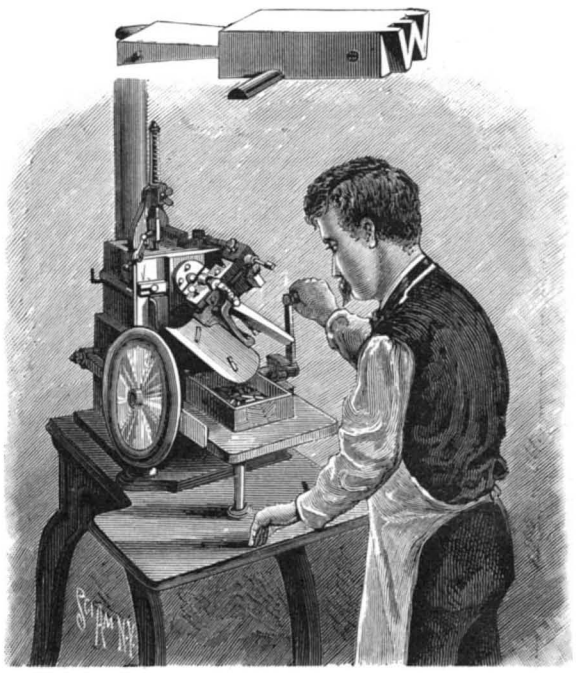
The forms of printing types and the manner of their use are so commonly understood that no account of them is needed here. The types with which all letter-press work is done must be uniformly "type high," which is a trifle over seven-eighths of an inch. Of these types, a page such as this will contain about 25,000 separate pieces, counting the points, the spaces, etc., although, as "set up" by the compositor, the "spaces" between the words, the "leads" between the lines, the "quadrats" for filling out the blanks at the ends of paragraphs, etc., not being "type high," do not show in the print. Counting the capitals and small capitals, the italics, figures, punctuation and reference marks, etc., there are about 250 different pieces in every font of type, and all of these pieces must be kept in complete assortment for each different size of type, as well as for every different "face." There are, for instance, five different regular sizes of type smaller than that in which this article is printed, and in each of these sizes there are many different faces, even in the plain Roman styles, to say nothing of hundreds of kinds for ornamental work. These types have little nicks low down on the body of the metal, by which the compositor may readily see how to place them right side up, and a small groove is taken out of the bottom, so that each type, when composed in the page or column, will stand on its "feet," as they are called. It will be seen how exact must be the measurement and "fit" of each of these little pieces when it is remembered that, in the slight iron frame which holds them together in the pages of the largest newspapers, the pressure from the sides put upon the types, so that they will hold together in a body when lifted, is only just sufficient to overcome the weight of the metal. The types, thus set up in columns and pages, are ready for the press, except the work is of sufficient importance to have stereotype or electrotype plates made, in which case the types are used only to make the mould, and the printing is done from the plates. The SCIENTIFIC AMERICAN is printed from electrotype plates, which give a sharper and clearer impression, and will also allow of the printing of a much larger number of copies before showing wear on the fine lines of the engravings, than can be obtained from any stereotypes. The most of the large daily papers are now printed from stereotype plates. This improvement has been introduced within the past twenty years; the plates are necessarily made very quickly, and with many imperfections which would not be tolerable in fine work, but the making of plates greatly facilitates the printing of all large editions, for, the type being once composed, any desired number of plates can readily be produced. It is worthy of remark, however, that the general adoption of the practice of stereotyping their forms by the leading newspapers, and the copper-facing of the type, whereby the wear of the letter is greatly extended, seemed to have hardly any effect on the business of type founders; the demands for larger quantities and a greater variety of type have grown so steadily that even these great improvements did not appear to diminish the call upon the founders.

We have in the preceding three numbers sketched the manufacture of power printing presses, book paper, and printers' ink, and, for our illustrations in this paper of the manufacture of printer's type, so naturally associated with the above, and completing this class of industry, we show the leading operations in the large type foundry of Messrs. Farmer, Little & Co., of New York, a firm employing from 175 to 200 hands in the business, and making all descriptions of printer's plain and ornamental types, borders, rules, dashes, etc., besides making their own type-casting machines, steel punches, matrices, etc.

The large view at the bottom shows the main type-casting room, which occupies the entire top floor of the large six story building, 63 and 65 Beekman street, seen in the central picture. The machines for casting are most of them ranged around near the windows, to give the best of light, which is very important. The machines only take up about as much room each as a sewing machine. Each one of them has a little coal-burning furnace for melting the type metal, and about a quart of the molten metal is held in an open reservoir at the top. Though these machines are sometimes operated by power, the advantage of so doing is by no means clear, for there must be so many stoppages in doing careful work that but little can thus be gained. The operator turns a crank, which brings the mould up to a little spout projecting from the pot, from which the metal is forced into the mould, when the latter flies back and automatically drops its type, this operation being repeated with every turn of the crank. Care must be taken that neither the metal nor the mould get too hot, and the mouth of the spout must be frequently cleaned of refuse metal not taken in by the mould.

The type casting machine was first successfully operated in this country about 1840. By its use type are cast fully fifty per cent cheaper than they were by hand. The speed at which it may be run varies according to the kind of type, the plain newspaper types coming from the machine as fast as 100 or more a minute, while the ornamental types and all larger job types have to be cast a good deal slower In the latter case a perceptible interval has to be allowed for the hardening of the metal in the mould, which, with the smaller types, is instantaneous; and in all scripts, where a portion of the letter extends over the body, the work has to be done slowly to prevent these parts from being broken off.

In the view at the upper left hand corner may be seen the work of dressing and finishing the types after they come from the casting machine. Each one, as it drops from the mould, has a little jet or ingot of surplus metal attached to the foot; these are broken off singly by boys, when men rub the broad sides of the types on stones to remove any roughness on the edges; where the metal has to be dressed out around a face projecting over the body, workmen of a different branch are employed, called kerners. After this the types are arranged on long rules or dressing sticks, in lines three feet long, and, each line being firmly fixed in a kind of metal planer, a cutter is passed over the edges, to make them perfectly true. A light scraping is then taken off the body of the type next the face, and a groove is run through the bottom, where the little jet or ingot of surplus metal had been broken off, and making the "feet." This work is all done by the piece, the casters, dressers, and finishers being all paid so much a pound, according to the size and kind of type.



CASTING TYPE.

The right view at the top shows where the steel dies or punches are made, and where the types, as they come from the finishers, are divided up into the proper allotment of letters and sorts for each different font. Type founders take orders for fonts of all sizes, but in the making of plain body letter it is usual for them to arrange all that is necessary for a complete font in a "scheme" for about 300 or 600 pounds, and then, when any smaller amount is ordered, divide up the type proportionately. Before this work is done, however, the types are all carefully examined with magnifying glasses to see whether any imperfect or defective letters have been passed by.

The letter engraving, which is also shown in this view, consists entirely in cutting the dies on steel for the face of the letters. Soft bar steel is used, which is hardened after the cutting, and all the work is done by hand. These dies are used for making matrices, in copper, to place in the moulds for the different faces required. These matrices are struck out of a piece of copper weighing at least three times as much as they do when finished, and then worked down, so as to insure the greatest exactness.

In the illustration at the right in the middle, is shown the department where the type-casting machines are made, and where the matrices and moulds are severally adjusted. There are a good many pieces required in the mould for casting a type no larger than a pin, and these, while being constantly subjected to a pretty high temperature and wearing usage, must be kept as true and exact as the works of a fine watch.

In the same room also may be seen the work of making brass rules, which are always used between the columns of type in newspapers, and for the dashes between articles, etc. The sheet brass used for this purpose is furnished by the brass manufacturers cut in strips of proper width to allow of facing, and of the required thickness. The facing and finishing of these to make ordinary newspaper rules is done with planers, by hand, but for making wave rules and ornamental dashes, different kinds of steel cutters are used. Here also the "leads" and "slugs" are made. The former are thin strips of type metal, cut to the width of the column, and placed between the lines of type when it is desired to give the printed matter a clean and open appearance. This page is leaded, with perhaps two leads between the head lines, and a thin slug between the rule at the top of the page and the first line of type.

In the illustration at the left, in the middle, is shown the process of electroplating, with copper, the illustrations, newspaper headings, etc., made by the firm. The copper will give the finest lines, and is much more lasting than type metal. The thickness of this coating varies according to the work, or as may be desired, from $\frac{5}{1000}$ to $\frac{12}{1000}$ of an inch.

There are five kinds of metal used by type founders generally, according to the particular work in hand. These all consist of different proportions of lead, copper, tin, and antimony. Though many other combinations have been recommended, and used to some extent, these are the only metals generally and successfully employed. The quadrats, which correspond with the white spaces in the printed page, and on which the least wear comes, are made of the cheapest metal; the smallest types, on the other hand, require the hardest, toughest, and dearest metals, while the medium-faced types, such as would be used in ordinary books, have a grade of their own, as have also the ornamental job types and the script. Messrs. Farmer, Little & Co. have always paid particular attention to this department of their business, and can point with satisfaction to the long continued use their fonts have withstood.

The want of accuracy in the justification of type would be a fault for which all other good qualities combined could not atone. To secure this, however, only the best of machine work must be employed in the fitting of the moulds and the finishing of the matrices, as well as in the dressing and finishing of the type; and in this branch of the business the complete appliances and experienced workmen, the firm have, afford the best of evidence that, by properly appreciating its importance, they have won the right to claim special excellence in this direction.

The number of "new faces" which any type foundry will get out in a given time depends largely on the state of general business. The firm of Farmer, Little & Co. have always been fully up with the times in this kind of enterprise, and some of their styles of type, both plain and ornamental, as well as their very elaborate combination borders, are to be found in almost every considerable printing office in the land. It is as difficult for a really good printer to see a nice new face of type without buying a font of it as it is for a fashionable lady to do without the latest style of bonnet. But in the variety this house can present of types they have originated in their long business career, they have an advantage which only an old foundry can offer.

The house was established in 1810, and since that time they have been constantly accumulating dies and matrices, which always constitute the most valuable portion of the stock of a type foundry. Of the present members of the house, it can be said that they are all active workers and practical men in their trade, the senior of the firm having been about fifty years continuously connected with the business.

Signaling Instruction.

The spring signaling instruction has commenced at Fort Preble, an hour's drill each day For this army system of signaling is claimed superior simplicity over all others, its advocates claim preference for it over the Morse alphabet, and certainly its messages are more easily transmitted by ordinary appliances. No sailor ignorant of a code should be allowed to go to sea in any capacity of command. Magnetic telegraphs and Edison telephones are well enough in their place, but a ship on a lee shore needs its officers and the coast guard to be well instructed in Myer's Code. It should be taught in all our schools. We give the alphabet below for the benefit of the curious. The second columns are the equivalents for which the corresponding letters may serve as contractions. With four of any two kinds of things, fixed signaling can be done. Calling one's right side one, and his left side two, he can transmit any message by waving a handkerchief according to the following table.

Letters.	Word Equivalent.	Signal Number.	Letters.	Word Equivalent.	Signal Number.
A	after	22	P	put	1212
B	before	2112	Q	quiet	1211
C	can	121	R	are	211
D	did	222	S	station	212
E	of the	12	T	the	2
F	for the	2221	U	you	112
G	ground	2211	V	very	1222
H	have	122	W	wood	1121
I	if the	1	X	next	2122
J	———	1122	Y	why	111
K	o'clock	2121	Z	———	2222
L	———	221	&	———	1111
M	———	1221	ing	———	2212
N	not	11	tion	———	1112
O	of	21			

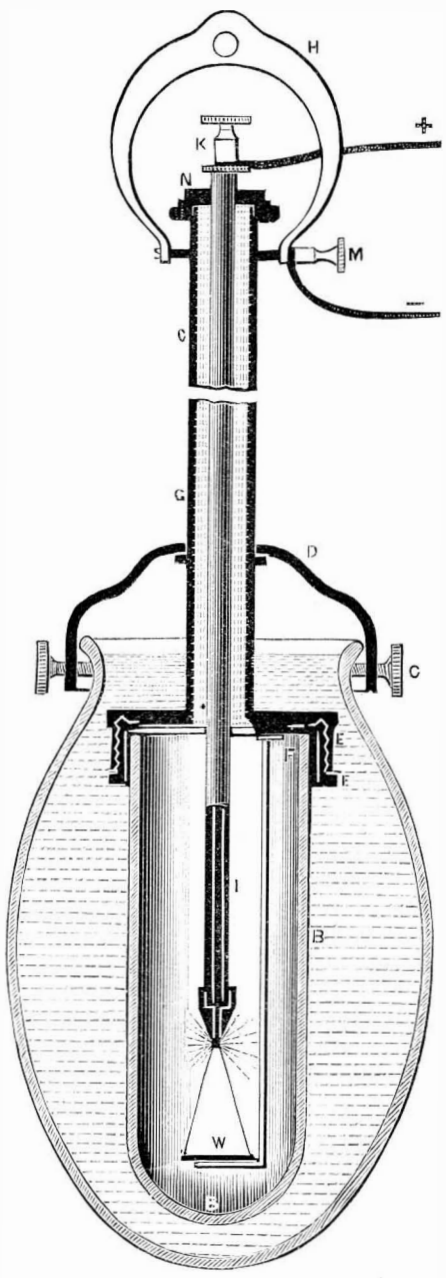
If we have four apples and four oranges, and we designate the apples ones, and the oranges twos, with them then we can spell out anything Thus to spell the word *system* we would from our right to left (so that they may come in regular order for the reader) first place an orange, then an apple, then an orange (= 212 = S); after withdrawing the S place an apple, an apple, and an apple (= 111 = Y); next repeat the S (an orange, an apple, an orange), next place an orange (= 2 = T), next an apple and orange (= 12 = E), and last an apple, an orange, an orange, an apple (= 1221 = M).

With a small flag a sweep to the left, two to the right, and one to the left would spell *be*. A great many contractions can be made and are introduced in the code.

© 1880 SCIENTIFIC AMERICAN, INC

THE ANDRE-BROUGHAM ELECTRIC LAMP.

In the annexed engraving is a representation of an electric light invented by Professor André, who, with the assistance of the Hon. R. T. D. Brougham, has devised a lamp which is said to be very efficient. We take the following description from the *Engineer:*



THE ANDRE-BROUGHAM ELECTRIC LAMP.

The value of the improvement will at once be seen when we state that it reduces the carbon consumption to about 0·125 in. per hour, while a similar carbon burnt in a lamp open to the atmosphere burns about 6 in. per hour, the cost in carbons being thus reduced to 1-48th of what it would be in an ordinary lamp. This is, probably, a maximum reduction, inasmuch as the carbons in ordinary lamps are of a larger diameter, those used in the André-Brougham lamp being only 2 mm. diameter.

The improvement consists in surrounding the lamp, or a portion of it, with a separate vessel of glass containing water or some other suitable liquid. In the accompanying diagram, B B B is the glass globe of the lamp proper, A A the surrounding vessel containing the liquid. The shape of these vessels is immaterial. It may, perhaps, conduce to simplicity if the lamp is first described. Two concentric tubes (G G, I I I) are separated by a non-conductor, such as plaster of Paris. These tubes are connected to the two terminals of the battery by the binding screws, K M. The outer tube, G G, is in electrical contact with the pyramid shaped piece of metal, W. The inner tube, I, contains the carbon rod, which rests upon the metallic wedge and falls down by its own weight, and that of a small weight placed on the top of the carbon, but within the tube. No doubt the light is due partially to incandescence of the carbon, and partially to the formation of an arc. The cap, N, on the top of the tube, G G, through which the inner tube passes, is of vulcanite or other non-conducting material. Round the top of the lamp globe, B B B, is a metal cylinder to be screwed into the corresponding cylindrical E^1 E^1. The ring, E E, has a sharp edge at the top, while E^1 E^1 has a corresponding recess. Between the two is an India-rubber washer, F F, so that on screwing E E the India-rubber is jammed into the recess in E^1 E^1, and a good water-tight joint made. The lamp is fitted with a cap, D D, to which, by means of binding screws, C C, and clamps, the vessel, A, is fixed. This vessel is partially filled with water or other liquid, so that when in its proper position the liquid rises above the cap, E^1, thus rendering the permeation of air into the lamp an impossibility. So long as the liquid in A is above the cap, E^1, no atmospheric air can enter the lamp globe, B, a tight joint is obtained, and at the same time the heat from the lamp is carried off or dispersed, and the light more or less diffused.

Late Development of Sugar in Sorghum.

Dr. Collier, chemist of the Agricultural Department, explains the frequent failure of sorghum to yield a profitable quantity of crystallizable sugar by the results obtained by his experiment last year. His Chinese sorghum, for example, attained its growth, and to all appearance was ready for the harvest on the 6th of August; but an experiment on that date resulted in getting only one and eighty-five hundredths per cent of crystallizable sugar, with about five and fifty-five hundredths of glucose or uncrystallizable sugar, while three weeks later the percentage of crystallizable sugar had reached twelve and fifteen hundredths per cent, and the uncrystallizable matter was only three and forty hundredths per cent. This species of sorghum reached its maximum for profitable production on the 14th of October, on which date the percentage of crystallizable sugar was fifteen and five hundredths per cent of the weight of juice expressed.

Experiments with the early amber, the variety best suited to this latitude, began on the 18th of July, giving a result of four and forty-three hundredths per cent of crystallizable sugar, with three and seventy-seven hundredths of glucose. The percentage of crystallizable sugar rapidly increased until the middle of August, when it exceeded fourteen per cent. There was very gradual increase until the 29th of October, when it reached seventeen per cent of the juice expressed, the uncrystallizable sugar on that date being only one and ten hundredths per cent.

About a week previous to this date there was a severe frost, and cold weather continued for several days. During the time stalks were cut and experiments were continued, showing that the frost had no bad effect upon the crop. When a thaw came, however, the effect was immediately apparent in the rapid decrease of valuable matter and increase of worthless matter in the juice; and this effect was noticed in all varieties of sorghum. The inference, as drawn and stated by Dr. Collier, is as follows: "Let your crop stand as long as you can; but if a frost catches you before it is gathered, hurry up and get it squeezed before a thaw comes."

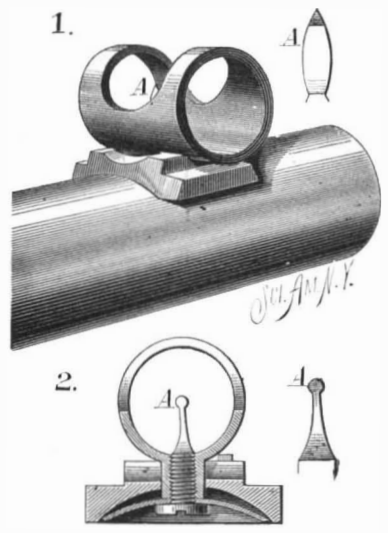
The Moss Industry in Louisiana.

The New Orleans *Times* says that the moss industry of that region has quite recovered its former flourishing condition. The moss is mostly gathered by negroes. Cypress moss is preferred, as it is the longest and most tenacious of all the varieties. After the moss is gathered it is placed on a sunny spot, and left a month to the action of wind and weather. At the end of that time the grayish bark peals off, leaving the hair almost clean. Some of the moss requires no manipulation, while other assortments are, in weight, more than half dirt. After being thus dried the material is sold to the plantation storekeeper or to the cross-roads groceryman, and the gatherer receives from one to two cents a pound for it, according to its quality. The stuff is baled and sent to New Orleans for manufacture. After the moss reaches the factory it is subjected to the action of the washer, which is a large cylindrical arrangement with a wheel inside, which pulls the moss hither and thither and dashes it through a vat of boiling water and soap, until the stuff is cleaned. Then it is hung out upon the racks to dry. This done, it is put into the duster, a fan mill, which entirely removes all the dust that may have survived the washing process. The moss comes into the factory yellow in color and goes out inky black. The article is then made up into bales, according to quality, and lettered with single, double, treble, and quadruple X's. The highest grade, XXXX, can hardly be distinguished from the finest and choicest horsehair. The other grades are consumed mostly in Louisiana. Seven years are required for the growth of a crop of moss after a tree has been stripped.

NOVEL SIGHT FOR FIREARMS.

The annexed engraving shows a new combination sight for firearms recently patented by Mr. O. D. Warfield, of Chicopee Falls, Mass. The invention consists in arranging its tube or cover of the sight so that it may be turned around on its base in such a manner that while in one position the sight or bead is seen by looking through the tubes the same as in an ordinary covered sight, and when turned in the other position the point of the sight is exposed uncovered.

Fig. 1 shows the sight attached to the barrel of a gun and turned so as to show the point of the sight, A. The shape of the sight as seen in this position is shown in the small detail view above the end of the barrel. The appearance of the sight when turned into the other position is shown in Fig. 2.



IMPROVED SIGHT FOR FIREARMS.

The tube which incloses the sight is held in either of its positions by concaves formed in the base piece at right angles to each other. The spring under the base draws the tube down into the concave and holds it accurately in position.

NOVEL SPEED REGULATOR.

The engraving shows a new combination of mechanism for regulating the speed of sewing machines and other light machinery. It consists of two conical drums, A B, journaled in a rectangular frame, with their larger ends oppositely arranged and their contiguous faces parallel.

A friction wheel, C, is placed between the two conical drums and journaled in a support attached to the end of a rod passing through the spring barrel, D. The shafts of the conical drums, A B, each carry a pulley, one to be connected by a belt with the motor, the other to be connected with the machine to be driven.

A cord is attached to the support of the wheel, C, for drawing it along between the drums, A B, so as to communicate motion from different portions of driving drum to different places on the driven, and thus vary the speed, making the speed of the driven drum either faster or slower than the driver.

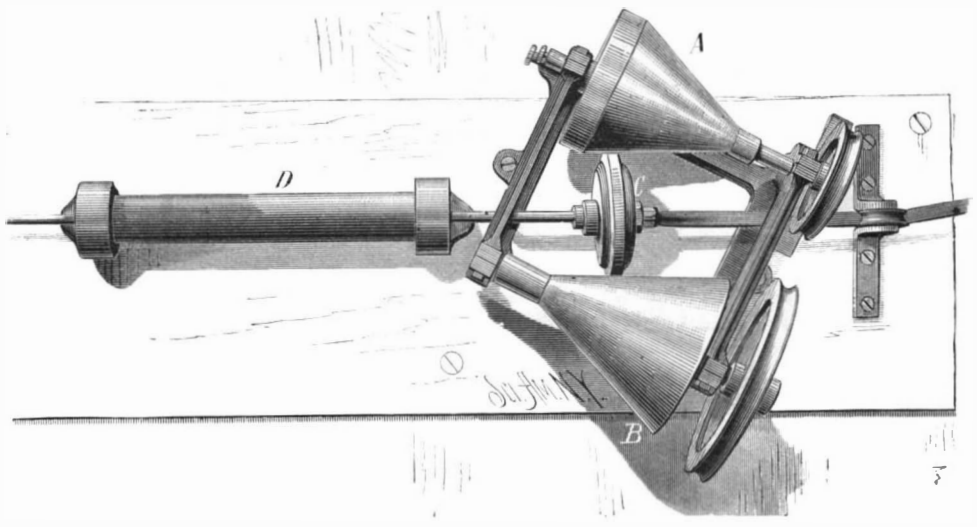
The bearing surface wheel, C, is made of rubber or similar material, and as it becomes compressed or worn, the difference in diameter is compensated for by moving the drum, A, longitudinally on its shaft.

The base of the cone, A, is cut away as shown, thus permitting the traveling friction, C, to stop the machine by disengagement.

This device is capable of controlling any speed within reasonable limits from 1 to 1,000 or 1,200 revolutions per minute. It can be used to stop and start, which it does instantly.

With this regulator when the speed is reduced the power is correspondingly increased, so that when a slow motion is transmitted it is with a great deal of force. This feature will prove particularly useful in that class of motors that obtain their power from the multiplication of small impulses, as in the case of small electrical or water motors.

Further information concerning this useful invention may be obtained by addressing Mr. H. R. Barnhurst, Erie, Pa.



BARNHURST'S SPEED REGULATOR.

Water System of New York.

During the past four years the Department of Public Works has added to the Croton Water Service 70 miles of distributing pipes, making the present extent of pipes 480 miles. The Croton aqueduct supplies 95,000,000 gallons a day. The elevated railroads consume over half a million gallons daily.

NEW PETROLEUM FIELDS.—It is reported that petroleum has been discovered in large quantities in the vicinity of Lake Ainsley, Cape Breton; also in Alabama.

© 1880 SCIENTIFIC AMERICAN, INC

AGRICULTURAL INVENTIONS.

Mr. William B. Garoutte, of Republic, Mo., has invented a novel cotton and seed planting machine. This improvement relates to machines for forming a mould or ridge, dropping the seed along the ridge, and covering the seed.

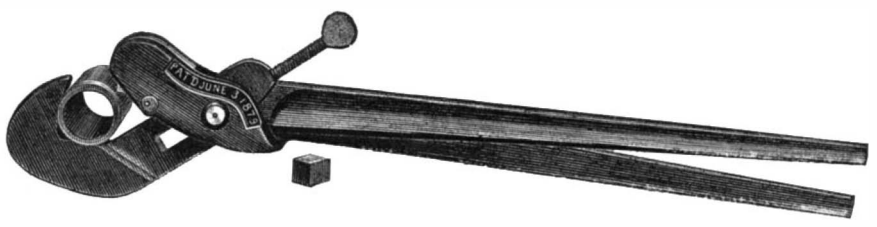
Mr. William L. Dietz, of Schoharie, N. Y., has patented an improvement in scrapers and cultivators for broom corn, cotton, and other plants planted in rows and drills, so constructed that they may be readily guided to operate upon crooked rows and may be conveniently turned at the ends of the rows.

IMPROVED PIPE TONGS.

The annexed engraving represents an improved pipe tongs manufactured by Messrs. Noble, Hall & Co., of Erie, Pa. The handles are pivoted on the usual rivet, which extends also through cheek-pieces attached to one of the handles. This construction gives a firm bearing to the pivot, and avoids the twisting motion which is usually so destructive to the tongs. The cheek-piece has a rectangular recess formed in it for receiving a cube of hardened and tempered cast steel. This cube is always held with one of its corners toward the center of the tube, whether the pipe being turned or held is large or small. It will be noticed that the steel cube has twelve available corners, so that as one becomes dulled by use another may be put into position for work. The cube or bit is held in its socket by a tapering pin extending across the mouth of the socket.

After the cube becomes worn on all of the corners it may be sharpened by grinding and replaced with enough backing to compensate for the metal ground away; and after it is worn so that it is incapable of further use it may be replaced by a new one at a slight cost.

One of the jaws is made adjustable by a thumbscrew to adapt the tongs to different sizes of pipe. This firm make also tongs of the same general character without the adjustable jaw. The manufacturers claim that for strength, durability, simplicity, and cheapness these tongs have no equal in the market.



THE ACME CUBE PIPE TONGS.

ICE-MAKING APPARATUS.

The accompanying engraving represents an ice-making apparatus designed and constructed by the Boyle Ice Machine Company, of Chicago, Ill., who are the patentees and manufacturers of ice machines and refrigerating apparatus.

The engraving shows a one-ton ice machine. On the left is seen a steam boiler and a combined engine and ammonia pump; in the center a pump for water supply for gas condenser, and on the right a freezing tank. The ammonia pump is used for compressing the ammonia gas which is liquefied in the condenser, and is expanded in a freezing tank seen at the right in which the cold is produced.

The freezing tank where the ice is produced is provided with coils of iron pipe, in these the gas evaporates, and they are placed at regular spaces apart, the spaces being regulated by the thickness of the ice required. Between the coils are placed moulds or cans containing the water to be frozen, and the space about both moulds and coils is filled with strong brine.

The operation of the machine is as follows: The pump being put in motion, a valve leading from the condenser to the evaporator coils is opened and the liquid gas flows into the evaporator coils. There, meeting with the heat in the salt water to be cooled down, it expands very rapidly, taking up the heat which is in the brine, which, in turn, extracts the heat from the water in the moulds. The expanded gas is aspirated by the pump and forced over into the condenser, where the heat is taken from it by a stream of water continually flowing over it, and under the pressure of the pump is reliquefied, and returns again to be expanded in the evaporator coils.

This process is continued until such time as the water may be frozen, when the mould is lifted from its place in the freezing tank and immersed in warmer water, which loosens the ice from the mould, when it is readily removed; and the mould, being refilled with water, is again returned to the freezing tank.

The ammonia pump (patented by the Boyle Ice Machine Company) is single acting, and works with regularity and smoothness; no water is required in order to keep its piston rod cool, and the pressure on the stuffing box never exceeds fifteen pounds to the square inch, avoiding all trouble in keeping the stuffing box tight and leakage of ammonia.

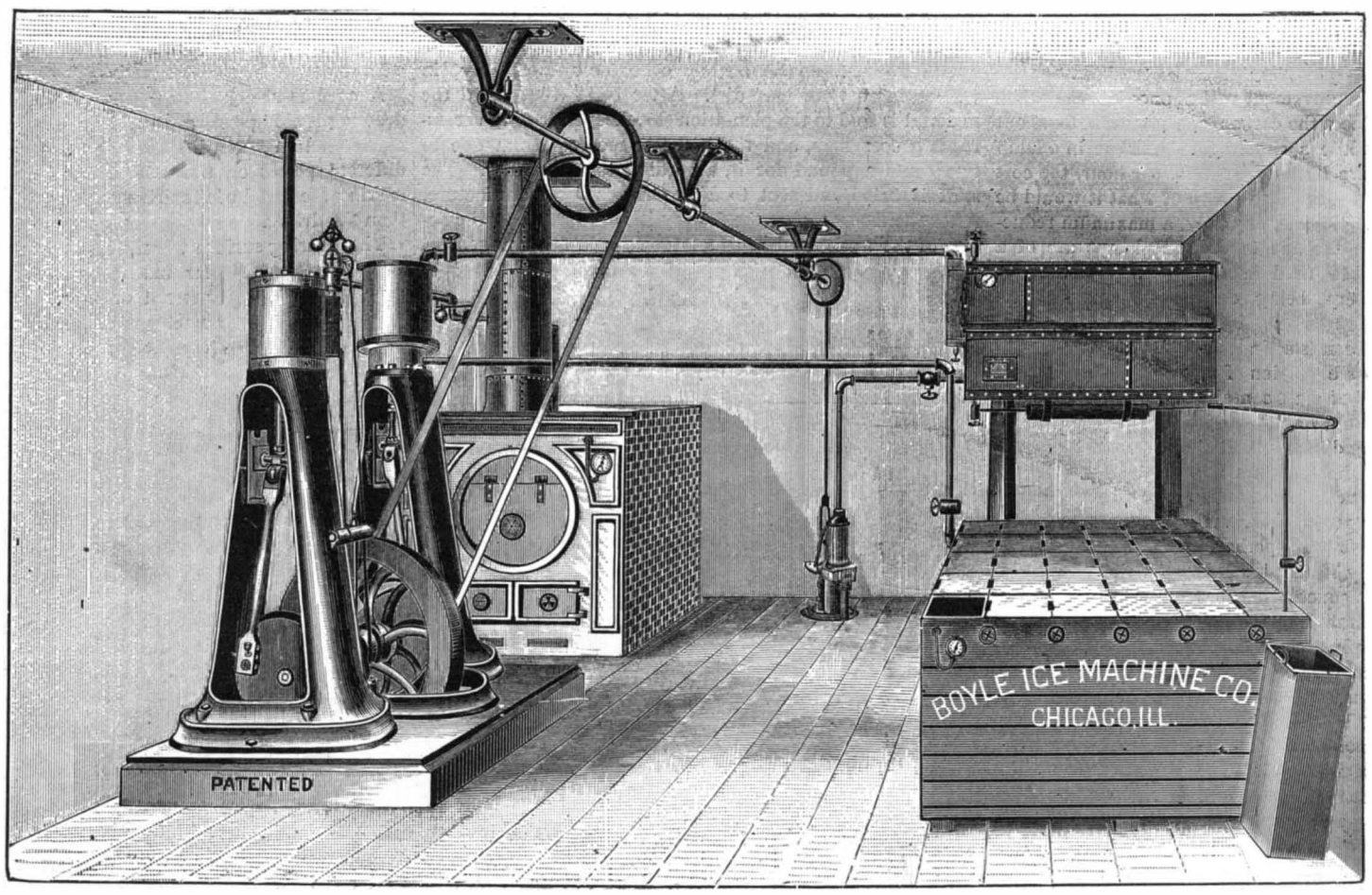
In making a calculation of the entire expense of operating a machine of any size, there should be an allowance made for the oil used in lubricating the engine, and for the expense of ammonia. An allowance of fifty cents per day for the smaller sized machines, and of one dollar per day upon the larger sized machines, would be ample for this item.

It is claimed that repairs would not ordinarily amount to one per cent per annum upon the cost of the apparatus. Calculations by this company for the production of ice and for all expenses connected with the operating of a complete ice factory are upon the conditions incident to the hottest weather in the South; and in a more temperate climate, with cool condensing water, the expense for fuel would be decreased considerably, as well as the supply of water necessary for condensing the ammonia.

Machines with which ammonia is used as the necessary refrigerant have proved to be among the best and the most efficient machines for the purpose; they are not liable to explosion or causing fire.

The machines referred to are of a simple character, have few parts, and are easily managed by any mechanic of ordinary intelligence. Their efficiency and reliability, their durability and inexpensiveness of operation, the manufacturers state, are beyond all question, as certified to by several extensive manufacturers and professional experts.

Further information and circulars containing full details of construction and mode of operation, and testimonials from parties using these machines, may be obtained on application to the Boyle Ice Machine Company, No. 10 North Jefferson street, Chicago, Ill.



BOYLE ICE MACHINE.

Straightening Hardened Steel.

In hardening and tempering tools they sometimes spring, to the great annoyance of the workmen, and not seldom the tool is reheated and rehardened. In most cases this may be avoided. To straighten a piece of steel already heated and tempered, heat it lightly, not enough to draw the temper, and it may be straightened by blows from a hammer, if the character of the tool will admit of such treatment, or, as in case of a tap, it may be straightened by a heavy mallet on a hard wood block. Although the steel when cold would break like glass with this treatment, when slightly warmed it will yield to moderately heavy blows uninjured.

ENGINEERING INVENTIONS.

Mr. Harry M. Sciple, of Selin's Grove, Pa., has patented a portable steam engine combining the features of lightness, durability, and cheapness. The invention consists in a vertical steam engine having the base, column, pedestal, cylinder, and steam chest cast in one piece and fitted with the cylinder head and crosshead guides, that are cast in one piece, whereby the required strength is obtained, and there is but a single joint to be fitted.

An improved signaling apparatus for railroads has been patented by Messrs. Richard B. Ireland, of Trenton, and William H. McDonald, of Newark, N. J. The object of this invention is to provide for operating a signal located at one point on a railroad from different places —say from two separate switches—in such manner that the signal shall be exhibited when either switch is open and until both are closed, or so long as the main line is not clear.

Mr. Hiram N. Wickes, of Grand Gorge, N. Y., has invented an improved car coupling that couples automatically without requiring any one to step in between the cars, the link being held in horizontal position, so as to secure its entrance into the opposite drawhead. The invention consists of a drawhead, with internal cavity having upwardly inclined rear portion and central guide rib, along which a centrally grooved roller is carried by the link.

Mr. Jean L. Nevers, of Pass Christian, Miss., has patented a water and wind mill, which the inventor calls a "wing motor." It is simple, automatic in the adjustment of its sails, and capable of utilizing a large percentage of the power of the wind and current of water.

Mr. Richard B. Ireland, of Trenton, N. J., has patented improvements which relate to signaling apparatus used in the "block" system of signals for the movement of trains, in which system the road is divided into sections or blocks, with a signal station between each block, and no train allowed to pass a station without a signal from the operator. Heretofore there has been great liability of the engineer mistaking the signals; and the object of this invention is to prevent such mistakes, which is accomplished by giving to the signals a definite form and position, either of which will indicate, in addition to the color, the exact character of the signals The inventor states that the apparatus may be worked in connection with two or more switches with one wire and one slide.

Mr. Stephen B. Segur, of Gold Hill., Nev., has patented an improved hoisting device, the object of which is to prevent hoisting cages in mines or elevators of any description from being raised so high as to endanger the lives of miners or others working in connection with hoisting apparatus or being carried up by elevators. The invention consists in a safety hook of novel construction and in means for detaching the same from the elevator car.

Mr. Henry Case, of Brooklyn, N. Y., has patented a composite pile for submarine foundations and other purposes that shall withstand decay or the attack of worms and insects better than a wooden or iron pile.

Mr. Albert Bonzon, of Santiago, Cuba, has patented a new attachment for the second-hand shaft of clock or watch works which will cause the second-hand to beat seconds, and which is so arranged that these beatings of the second-hand can be interrupted or started at any desired moment.

© 1880 SCIENTIFIC AMERICAN, INC

CAPTURE OF A LARGE FINBACK WHALE.

We publish herewith a picture of the large whale now on exhibition in this city. It was captured on March 18, two miles off Provincetown Harbor, Cape Cod, by a whaleboat's crew of five fishermen, armed with a bomb-lance and gun. He was purchased from his captors by Swift & Co., of Provincetown, for $600, and towed to this place by the tug Charles Lawrence, requiring four days and nights for the passage. Arrived, the monster was floated on a drydock, and has since been viewed by thousands of people.

The back of the whale is hard and shines like ebony; the belly is white like ivory, and where the two meet at the sides it takes a slaty gray tint.

A series of wrinkles, as if scored by fire, run backward and upward from beneath the jaws like bilge keels on a vessel. The skin beneath the eye is also wrinkled in massive folds. The flesh, where exposed by scars or wounds, is red and firm like beef.

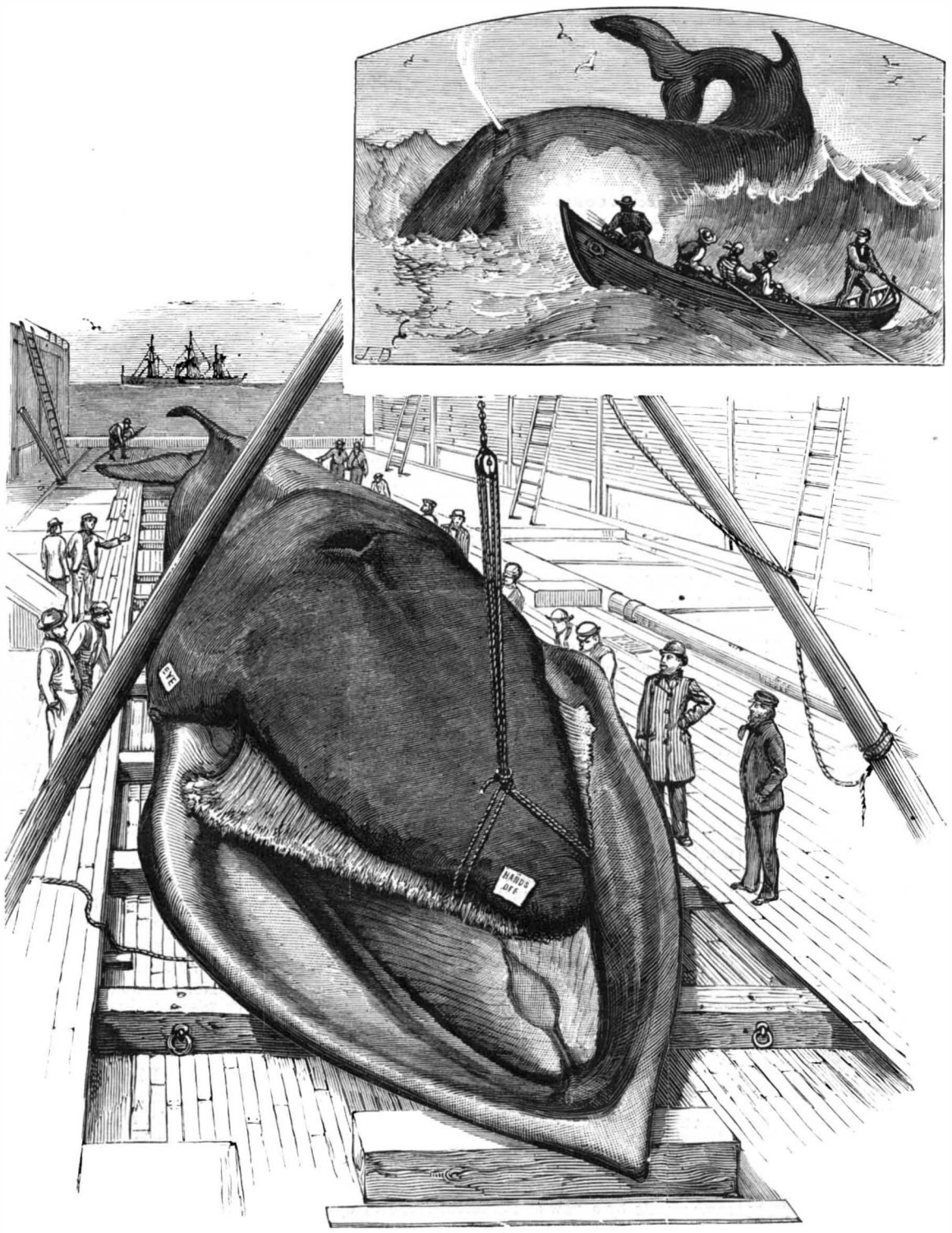
The head forms one quarter of its length. The body is 65 feet long, 15 feet in greatest diameter, and weighs about 70 tons. The eyes are very small, set a few inches back of the jaw socket. The spout hole crowns the summit of the head, 17 feet back from the nose, surrounded by a three-cornered ridge of bone and India rubber-like flesh. The tail is flexible, forked like a broad-arrow head, set sideways to the body, enabling the whale to dive quickly. From behind the eyes project two broad soft fins, and a little one springs from the sharp ridge near the tail, giving it the name finback.

The upper jaw is long, narrow, and concave, the edges smooth and rounded. In place of teeth there extends downward a whalebone formation like the teeth of a huge comb set obliquely, growing in size from a few inches at the nose to three feet or more at the jaw, the whole terminating in a stiff broom-like fringe of bristly hairs.

The lower jaw is entirely smooth, much wider than the upper, the latter fitting down into it like a cover, the bone fringe filling up the groove and serving as a strainer through which the water is expelled after a school of small fry is ingulfed in the maw. The tongue covers the entire inner surface of the lower jaw.

The orifice of the ear is hardly perceptible, yet the hearing is so acute that a ship crossing its track a half mile distant will cause it to dive instantly.

This species of whale is the most dangerous to attack, and the least profitable. It destroys vast numbers of small fish, and is worth only $500 for oil and bone. It fights desperately, and if badly wounded describes a large circle having a "swath," inside of which he makes his last stand, and woe to anything that ventures in. If left alone there he will die quietly, announcing his death by elevating his fins and turning his head toward the setting sun.



CAPTURE OF A LARGE FINBACK WHALE.

The Phylloxera Pest.

To compensate for their discomfort during the past almost unprecedented cold winter, the people of Southern France had hoped that it would result in the killing of the above insect pest, which has for the last few years been so destructive to their grape crop. But from the observations with regard to this made by M. Lichtenstein, he arrives at the lamentable conclusion that the phylloxera has not experienced the least harm from the temperature of ten to eleven degrees below zero. This applies not only to the insects deeply interred, but even to those near the surface. M. Lichtenstein found a number of other pucerons similarly resistent to cold. These little creatures, attached to the aerial parts of the plants which they attack, were completely benumbed and torpid, but after being transferred to the laboratory they proceeded with their hatching operations as if nothing had happened.

The Edible Sea Worm.

There is a very curious food product obtained in the Pacific, which is esteemed as highly as are whitebait in England; it is a small species of sea worm, a genus of annelids, known scientifically as *Palolo viridis*. The following account of it is given by a traveler. These worms are found in some parts of Samoa (Navigator Islands) in the South Pacific Ocean. They come regularly in the months of October and November, during portions of two days in each month, namely, the day before and the day on which the moon is in her last quarter. They appear in much greater numbers on the second than on the first day of their rising, and are only observed for two or three hours in the early part of each morning of their appearance. At the first dawn of day they may be felt by the hand swimming on the surface of the water; and as the day advances their numbers increase, so that by the time the sun has risen, thousands may be observed in a very small space, sporting merrily during their short visit to the surface of the ocean. On the second day they appear at the same time and in a similar manner, but in such countless myriads that the surface of the ocean is covered with them for a considerable extent.

On each day, after sporting for an hour or two, they disappear until the next season, and not one is ever observed during the intervening time. They are found only in certain parts of the islands, generally near the openings of the reefs on portions of the coast on which much fresh water is found; but this is not always the case. In size they may be compared to a very fine straw, and are of various colors and lengths, green, brown, white, and speckled, and in appearance and mode of swimming resemble very small snakes. They are very brittle, and if broken into many pieces, each swims off as if it were an entire worm. The natives are exceedingly fond of them, and calculate with great exactness the time of their appearance, and look forward to it with great interest. The worms are caught in small baskets, beautifully made, and when taken on shore are tied up in leaves in small bundles, and baked. Great quantities are eaten undressed, but either dressed or undressed they are esteemed a great delicacy. Such is the desire to eat "palolo" by all classes that immediately the fishing parties reach the shore, messengers are dispatched in all directions with large quantities to parts of the island in which none appear.

Many of the European residents in the Fijis eat the "palolo," and look on it as quite a periodical relish. It also makes its appearance in the New Hebrides, in Tongo, and in the Samoan or Navigator Islands identically with its advent in Fiji.

The Hittites.

One of the most interesting parts of Chief Justice Daly's annual review of recent progress in geographical exploration, before the Geographical Society, March 23, was that touching the important discovery of the seat of empire of the ancient Hittites. Judge Daly said:

The readers of the Bible will remember the frequent mention that is made of the Hittites, a people occupying Canaan, who are described in the biblical narrative as being commercial and military, and in whose country Abraham bought a piece of land for his burial place. The scattered accounts in the Bible simply indicate an ordinary tribe of people, with whom the Israelites had intercourse, but information derived from the researches made in Egypt and Assyria show that the Hittites, whom the Egyptians called the Kheta and the Assyrians the Khatti, were a powerful confederacy occupying the country which was the highway between Babylonia or Assyria and Egypt —a people actively engaged in commerce, their principal city being a place to which merchants from all parts congregated, and who were at the same time a warlike people, who for a long period kept the Assyrians in check, and who proved the most formidable antagonists the Egyptians ever encountered. They were not only commercial and warlike, but had evidently at a remote period made great advances in civilization and in the fine arts and early Greek art, as found in the discoveries of Dr. Schliemann at Mycenæ; and the early art found in Cyprus by our associate, Mr. Di Cesnola, is supposed to have been largely derived from them.

They occupied the whole country of Southern Syria, from the Mediterranean to the desert, dwelling chiefly in the fertile valleys of the Orontes, a river rising to the east of Baalbec and flowing into the Mediterranean, and had two principal cities—Kadesh, or the Holy City, and a great commercial emporium, which was their capital and the center of their power, called Carchemish. They were finally overthrown by the Assyrians, B. C. 718; and had so completely disappeared that they are scarcely ever referred to by Greek writers. Great interest was felt to discover the site of their commercial capital, Carchemish, and many conjectures have been made, none of which, however, could be verified. A few years ago Mr. Skene, the British Consul at Aleppo, discovered a huge mound of earth covering a large area on the western shore of the lower Euphrates, near a ford of that river on the route still traversed by caravans. This great mound was surrounded by ruined walls and broken towers, while the mound itself was but a mass of earth, fragments of masonry, and *débris*. It had frequently been seen by previous travelers, but they identified it with other lost places. Mr. Skene called the attention of the late George Smith, the eminent archæologist who brought so much to light from the ruins of Nineveh, to this mound, and Mr. Smith found here the long-lost capital of the Hittites. The present British Consul, Mr. Henderson, has been during the last two years engaged in the exploration of the mound, and has already sent important remains with inscriptions to the British Museum.

© 1880 SCIENTIFIC AMERICAN, INC

A few years ago a stone which had formed part of the wall of a house at Hamath had an inscription upon it which excited great curiosity, because it was neither Assyrian nor Egyptian, but something between both languages. It may be remembered that I called attention in one of my former addresses to the discovery of this stone and one or two others containing like characters, which were then called the Hamath inscriptions, with the suggestion that this might probably be the language of the Hittites, which is now proved to be the fact. The inscriptions found by Mr. Henderson in the exploration of Carchemish are not only of the same character, but the same language which Mr. Layard found impressed upon seals discovered by him in the ruins of the record chamber of Sennacherib's palace, and which greatly excited his curiosity, as the writing was unlike any ever noticed before. Another inscription was afterward discovered at Aleppo, by Mr. Davis, a missionary; and it also turns out that the famous figures sculptured above the roads from Ephesus to Phocea, and from Smyrna to Sardis, which are mentioned by Herodotus, and were supposed by him to represent the Egyptian King Rameses II., the Sesostris of the Greeks, had inscriptions in the same character as that recently found in Carchemish, showing that these figures also are Hittite monuments. It is supposed that this language was the source of what is known as the Cypriote syllabary, found in Cyprus, and which was probably the language in use among commercial people throughout Asia Minor until it was superseded by the simpler and more practical Phœnician alphabet. This discovery is exceedingly interesting, as the Hittites belong to the same race of people who perfected, by the invention of the alphabet, that greatest of human inventions, a written language. We have now, in this discovery of Mr. Smith, the memorials of a lost people, in neighboring proximity to the Phœnicians, of whom also we know so little—a people who had an important part in the early progress of ancient civilization, with respect to which an eminent Egyptian scholar expresses his conviction that future discoveries in the course of this exploration will afford convincing proofs that this civilization, which was of the highest antiquity, was of an importance which we can only guess at.

A writer in the London *Times* has said, in respect to these discoveries, that they have opened up to us an extinct civilization that existed before Rome or Athens was founded, of which nearly every trace and memorial had been lost until these discoveries were made a few years ago; that they have opened a new and earlier page in the history of mankind—in that of religion, science, and of the arts—by the discovery of the remains of this library, which Abraham may have consulted in what was the land of his nativity.

Fishes on the Pacific Coast.

At a recent meeting of the California Academy of Sciences, Professor Jordan, of the United States Fish Commission, said that the labors of himself and associates have, as yet, been principally confined to the waters of San Diego, San Pedro, and Santa Barbara. Among the specimens of fish examined were the European shark, of which little has been heard on this coast, but it is taken by thousands in Los Angeles waters for the oil. Mr. Jordan here exhibited a specimen of the true sole, the only one yet found on the Pacific coast. The fish sold in our markets as soles are different kinds of flounders. The one shown was picked up in the Chinatown of Los Angeles. Of the flounders, two new species have been found. One was caught just outside the Golden Gate, and is evidently the young of a species that grows to a large size. The only other specimens of the species known were found in Greenland. Another flounder was of the halibut form. Other new forms were found of the sting ray. It was found off San Diego, and is of the European genus. Another ray, caught off Santa Barbara, belongs to the Chinese genus. This is only another evidence that fishes of the same genera are common to both sides of the Pacific, and, as the speaker facetiously remarked, "forming another link between California and China." It is almost as easy, said Mr. Jordan, to find new genera as new species on this coast. Several sharks, about three feet long, were found off Santa Barbara, which have the peculiar faculty of inflating themselves with air when caught, until they are two-thirds as broad as they are long. This has only been known before by specimens brought from Van Diemen's Land. To the eleven species of rock cod, seven more have been added. Most of the new species are of a bright red color. Another new species of surf fish or perch was found in the San Francisco market.

A Wasp's Strategy.

Mr. Seth Green says that one morning, when he was watching a spider's nest, a mud wasp alighted within an inch or two of the nest, on the side opposite the opening Creeping noiselessly around toward the entrance to the nest, the wasp stopped a little short of it, and for a moment remained perfectly quiet. Then reaching out one of his antennæ, he wriggled it before the opening and withdrew it. This overture had the desired effect, for the boss of the nest, as large a spider as one ordinarily sees, came out to see what was wrong and to set it to rights. No sooner had the spider emerged to that point at which he was at the worst disadvantage, than the wasp, with a quick movement, thrust his sting into the body of his foe, killing him easily and almost instantly. The experiment was repeated on the part of the wasp, and when there was no response from the inside he became satisfied, probably, that he held the fort. At all events, he proceeded to enter the nest and slaughter the young spiders, which were afterward lugged off one at a time.

Decision on an Injector Patent.

March 10, 1880, Judge Wheeler, of the United States Circuit Court for the Southern District of New York, rendered a decision in a case in which Nathan & Dreyfus, proprietors of James Gresham's patent (No. 57,057) for "a supplementary jet-lifting apparatus for injectors," sued the New York Elevated Railroad and Wm. L. Chase for an infringement of that patent. The injector which they claimed to be an infringement was that known as the "Little Giant Injector," made and sold by the Rue Manufacturing Company, of Philadelphia. This suit was brought in 1876. The court sustained the validity of the Gresham patent, found that the "Little Giant" injectors complained of were an infringement of that patent, and granted an injunction and referred the subject for an accounting of the damages. Nathan & Dreyfus now give notice that lifting injectors of this pattern are infringements of their patent, and announce that they will settle for such infringements on reasonable terms with all users who respond promptly, and without litigation.

RECENT DECISIONS RELATING TO PATENTS, ETC.

U. S. Circuit Court.—Eastern District of Wisconsin.

GOTTFRIED *et al. vs.* THE PHILLIP BEST BREWING COMPANY *et al.*—IMPROVEMENT IN PITCHING BARRELS, PATENTED MAY 3, 1864.

[It is not often that so many interesting questions are involved and decided in a single case as in the following.]

JOINT INVENTION.

1. To overthrow the presumption of joint invention raised by the filing of a joint application upon a joint oath the evidence must be clear and unequivocal.

2. Joint invention is the result of mutual contributions of the parties; and if one suggests an idea in a general way and the other falls in with it, and by his aid develops and gives definite practical embodiment to it, the two may be considered joint inventors.

A LICENSEE FOR A PARTICULAR MACHINE CANNOT SUBSTITUTE THEREFOR A NEW MACHINE.

3. The defendants claimed to be licensees under the patent by reason of a purchase from one of the inventors of a machine used by him; but it appearing that said machine was subsequently torn down and afterward rebuilt of substantially a new construction, it was held that the identity of the original machine was thereby destroyed, and the evidence did not disclose such facts as to show that the patentees had expressly or impliedly given to the defendants license or permission to use such machine.

SIMPLICITY AND ECONOMY OF CONSTRUCTION ARE SUFFICIENT TO SUPPORT A PATENT.

4. The patent law protects simplicity and economy of construction as against prior complex and expensive combinations; and although the general and abstract effect may be analogous, if the two mechanisms produce their respective results by essentially different processes, the one being more simple and capable of being operated with greater economy than the other, it is not anticipated thereby.

REQUISITES OF SUCCESSFUL PRIORITY.

5. A prior patent or publication, to anticipate a patent, must appear in the description to embody substantially the same organized mechanism, operating substantially in the same manner as that described in the patent claimed to have been anticipated.

THE NEW ARRANGEMENT OF OLD DEVICES MAY BE PATENTED.

6. Old instruments placed in new and different organizations, producing in such situation different results, or the some results by a new and different mode of operation, do no prevent such newly-organized mechanism from being patentable.

TO OVERTHROW A PATENT THE ALLEGED PRIOR DEVICE MUST BE PERFECTED AND PRACTICAL.

7 To justify the court in overthrowing a patent granted for what appears to be a new and useful invention or improvement, on the ground that the device has been anticipated by another and earlier invention, the court should be well satisfied by clear and credible testimony that the alleged earlier invention actually existed; that it was a perfected device capable of practical use; that it was embodied in distinct form and carried into operation as a complete thing, and was not of such character as to entitle it only to be regarded as an unperfected or abandoned experiment.

8. A rude machine constructed for the purpose of experiment, and subsequently broken up, deserted, and abandoned, cannot be regarded as such a perfected invention as will defeat a patent

NEW COMBINATIONS OF OLD PARTS ARE PATENTABLE.

9. Although the various elements or parts of the patented mechanism, when separately considered, may be regarded as old, they are to be viewed in the light in which they have been combined in connection with the new and useful results which the combination accomplishes.

THE CLAIMS ARE TO BE EXPLAINED BY THE SPECIFICATIONS.

10 A claim to "the application of heated air under blast to the interior of casks by means substantially as described and for the purposes set forth," embraces the particular means and mode of operation described in the specification.

11. Claims containing words referring back to the specification must be construed in the light of the explanations contained in the specification.

12. It is sufficient for the purpose of distinguishing old parts from new in the specification and claims of a patent to describe each and all of the parts, and claim the mechanism as a whole, so constructed and operated as to produce the result set forth.

MECHANICAL INVENTIONS.

An improvement in axle boxes which will prevent the oil or grease from flowing out of the box, and will prevent sand from entering it, has been patented by Mr. Irving F. Burdick, of North Stonington, Conn.

An improved hay press has recently been patented by Mr. Beverly Tompkins, of St. Albans, West Virginia. This invention is an improvement on the hay press, for which application for patent was allowed to the same inventor June 13, 1879. It consists of a novel arrangement of levers for operating the traverser and follower of the press.

A harrow that can be readily adjusted for light or heavy work, be made to accommodate itself to uneven ground, and be moved anywhere without being taken to pieces, has been patented by Mr. William W. Cook, of Kansas Centre, Kan.

Diamond Making.

The London *Photographic News* sums up briefly the result of diamond making as follows: A hydrocarbon gas—such as marsh gas, for instance, which is composed of hydrogen and carbon—is put into a stout iron tube of considerable thickness. A nitrogen compound—presumably cyanogen—is also introduced, with a view to the nitrogen combining with the hydrogen, and leaving the carbon free, for a diamond, as our readers are aware, consists of pure crystallized carbon. The gas in the iron tube is subjected to enormous pressure to liquefy it, the tube being heated to aid in this work. The liquefaction of oxygen by Pictet, of Geneva, was effected by pressure in this way. The pure carbon passes under pressure from a gaseous into a liquid form, and finally crystallizes, in which condition it is found upon the iron tube being opened. The diamonds are, however, of the most minute character, and Mr. Hannay, of Glasgow, who has thus succeeded in making them, frankly owns that the game is not worth the candle.

When Trout May be Caught.

The *Sea World*, a sprightly little paper devoted to the fish interests, published at New Haven, Conn., gives the following information regarding the laws of different States in respect to trout fishing:

California, April 1 to November 1.
Connecticut, April 1 to July 1.
Iowa, February 1 to November 1.
Maine, May 1 to October 1.
Massachusetts, April 1 to October 1.
Michigan, May 1 to September 1.
Minnesota, April 1 to October 1.
New Hampshire, May 1 to October 1.
New Jersey, March 1 to October 1.
New York, April 1 to September 1.
North Carolina, January 1 to October 15.
Pennsylvania, April 1 to August 1.
Province of Ontario, Canada, May 1 to September 15.
Province of Quebec, Canada, February 1 to October 1.
Rhode Island, March 1 to August 15.
Vermont, May 1 to September 1.
Virginia, April 1 to September 15.
Wisconsin, April 15 to September 15.

Total Solar Eclipses.

According to Professor Davidson, of San Francisco, the most important total solar eclipses during the present century will be as follows:

Date.		Most favorable locality for observation.	Duration of Totality.
Year.	Month.		
1882....	May 17....	Arabia....	2 min. 00 sec.
1883...	May 6 .	Marquesas Islands	5 min. 15 sec.
1885...	Sept. 9..	New Zealand	2 min. 00 sec.
1886 ..	Aug 29.	West Africa	6 min. 21 sec.
1887....	Aug. 19....	Russia	3 min. 40 sec.
1889....	Dec. 22....	Angola, West Africa	3 min. 34 sec.
1893. .	April 16 .	Brazil	4 min. 44 sec.

The next total solar eclipse visible near the United States will be that of May 28, 1900, at 3 o'clock in the afternoon; wherein the central line of totality passes through Mexico, the Azores, and Egypt.

Water Cresses.

At a recent meeting of the Royal Horticultural Society of England, Mr. Shirley Hibberd exhibited a lot of home-grown water cresses, which created considerable interest among the members. The display consisted of a series of pans, fifteen inches in diameter, each filled with a luxurious growth of tender cresses. The exhibitor claims that the pan culture of water cresses may be profitably pursued with the aid of a frame or cool plant house during the severest winter weather. The cresses shown were produced in the course of six weeks, and had been daily gathered for the table, thus showing how rapidly and prolific they grow. According to the testimony of Mr. Hibberd any one may supply his table with this wholesome and delicious salad any time of year without much trouble or expense.

© 1880 SCIENTIFIC AMERICAN, INC

Correspondence.

The La Plata Mining and Smelting Company.

To the Editor of the Scientific American:

One of the most complete ore sampling and smelting companies in the carbonate region is the La Plata Mining and Smelting Company. Like most of the enterprises of this new and wonderful region, it developed into its present large proportions, from a small and unimportant beginning. About the middle of June, 1879, the present corporation was established with a capital stock of $2,000,000, in 200,000 shares, per value $10 each, although prior to the above date the firm of Berdell, Witherel & Co. had carried on the business of smelting ores with marked success. In order, however, to meet the increasing demands of a company where new discoveries of large mineral deposits followed so rapidly after one another, the La Plata company was organized, and with a cash capital of $100,000 business commenced on a scale before unthought of. The working capacity of the mills was largely increased by a judicious expenditure of nearly $50,000, and under the able management of C. B. Rustin, Nathaniel Witherel, and Theodore Berdell, seven dividends, amounting to $115,000, have been paid to stockholders.

The process of sampling and smelting ores in vogue at this establishment is thoroughly approved and entirely satisfactory in its workings and results. The different ores coming from the various mines are first deposited in bins holding about 30 tons respectively. Each mine has its especial bin, and the ores are kept entirely distinct and separate. For sampling purposes about one-tenth of a particular ore is taken, and is cut down to a sackful containing from 60 to 100 lb. This is run through a Blake crusher, which breaks up the larger pieces, and renders the whole sufficiently fine for the furnaces. One tenth of the residuum is then subjected to the Cornish rollers, which crushes it very much finer. The Aldin crusher then pulverizes it, and it is afterwards manipulated on the bucking board until it is of the consistency of a fine powder, capable of going through an "80 sieve." One-fourth of this powder is sent to the assay room, where the "assay ton" is taken, reckoned in milligrammes, and a valuation made of the entire amount of ore; one-fourth of the powder is given to the miner; the other two-fourths are bottled, labeled, and sealed for reference. Should the assay of the miner and the smelter disagree, the valuation is either determined by the other sample, or, to use a Yankee expression, they "split the difference." For purposes of smelting, the ores are taken from their bins and deposited in large "mixture piles" containing 300 tons each. These mixtures of ores are taken to the scales and weighed. It is determined in the laboratory what quantity of lime and iron shall be added for a flux to the various grades of ore. Having determined the requisite amount of fluxes necessary for a single blast, the compound mass is taken to the furnace room, where four large blast furnaces, with an aggregate daily capacity of 110 tons, are kept in constant blast. At the end of 24 hours the ore is run off in the shape of bullion pigs weighing 95 lb. The slag is run out from a different aperture, and is thrown on the "dump" as useless material. These pigs of bullion are carefully assayed to determine their exact value, and are then shipped to the Newark, N. J., refining works, where the silver is separated from the lead and the lead then refined. The product of the La Plata Mining and Smelting Company, from its organization, June 14, 1879, up to March 1, 1880, has been 1,155,661 oz. silver, and 7,083,769 lb. of lead, for which 36,917,396 lb. of ore were required. The aggregate yearly production of silver alone will considerably exceed a million and a half of dollars. The most imposing object that strikes upon the vision of the stranger coming into Leadville for the first time is the works of the La Plata Company. They cover 25 acres of ground, with a frontage of 550 feet. About the buildings of the works themselves, which are large and substantial, there clusters a small village of dwelling houses for the accommodation of the 100 employes of the company. The company owns and operates mines located in California Gulch, which yield an immense quantity of low grade mineral, so necessary for successful smelting. This together with its extensive patronage by such mines as the Chrysolite, Iron, Little Chief, and Climax mines, keeps the furnaces in constant operation.

To indicate the high position this company occupies in the business community it will be sufficient to name the officers of the corporation, as follows: C. B. Rustin, president; N. Witherel and Harry Allen, vice presidents; Theodore Berdell, treasurer and agent in Colorado; and Fredrick Sheppard, secretary. Mr. C. B. Rustin, aided by his energetic and experienced superintendent, Mr. M. E. Smith, directs and oversees with vigilance and ability every department of the complicated business. W.

Leadville, March 25, 1880.

The Voice of the White Perch.

A correspondent writing from Parkersburg, West Virginia, says, with reference to the note on voice in fishes, in the SCIENTIFIC AMERICAN, February 14, 1880, that the white perch of the Ohio river will often follow a boat for a considerable distance, all the time making a peculiar humming noise like that of a telegraph wire in the wind. He has heard the fish make the same sound when imprisoned in a fish box to keep it alive.

Glucose—Grape Sugar—Corn Sirup.

The wonderful impetus that has recently been given to the manufacture of glucose and grape sugar from corn, has awakened an interest in the early history of the industry and its introduction into this country. Mr. Lyman Bradley, one of the original inventors of the process of producing those articles from corn, writes to a Buffalo paper in reference to it as follows:

"Grape sugar was long before made from potatoes in Europe, and came here at a cost of from 8 to 12 cents a pound, in gold, when gold was at a premium of 40 per cent. But sugar from corn was not then known. In the year 1863, F. W. Gessling and Lyman Bradley, in the city of Buffalo, improvised a small factory for experimenting, to see if grape sugar, glucose, and sirup could be made from corn. Although sneered at and ridiculed by their friends as insane, they, by their persistence, succeeded, and in 1864 they obtained a patent, which may be seen on the records at Washington. In July, 1864, a committee of sugar manufacturers and chemists from New York visited Buffalo as experts, to report as to the value of the invention. They remained several days, testing the process. They returned, and others from New York took their places for the same purpose. The patentees employed a well known citizen of Buffalo to negotiate a sale of the patent, and on the 10th of November, 1864, a sale was made for $600,000, a stock company formed with a capital of $1,000,000, and stock issued, some of which may be seen in Buffalo bearing that date."

From the supposed folly of Gessling & Bradley has grown up a business in which nearly $30,000,000 are invested. Grape sugar has been made from potatoes and imported here to be used in making wine, costing near 12 cents per pound, it being better than cane sugar for that purpose, it having no taste but sweet if properly made. No grape sugar, no glucose, no sirup, was ever made on this continent or elsewhere from corn until after the invention so made by Gessling & Bradley, and if any credit is due to any one for inventing a process which is proving to be so valuable, the meed of praise belongs to them. For now, instead of importing an inferior article of grape sugar, made from potatoes, at a cost of 8 to 12 cents a pound, large quantities of grape sugar made from corn are exported at 3 cents a pound.—*The Western Manufacturer.*

The Compression of Gaseous Mixtures.

In a recent paper on this subject to the Paris Academy of Science, M. Cailletet begins with the remark, that when a mixture of air and carbonic acid was inclosed in the apparatus which had served him for liquefaction of gases, he found, as Andrews and several other savants had already observed, that the liquefaction of carbonic acid was retarded, often very greatly. It is even possible to compress at zero, beyond 400 atmospheres, a mixture of 1 volume of air and 1 volume of carbonic acid, without getting a change of aspect in the tube.

On compressing in the apparatus, he proceeds, 5 volumes carbonic acid and 1 volume air, the carbonic acid is easily liquefied. If the pressure be then carried to 150 or 200 atmospheres, the meniscus of liquefied acid, which, up to that point, was concave and perfectly distinct, becomes plane, loses its distinctness, then is progressively effaced; at length the liquid entirely disappears. The tube then seems filled with a homogeneous matter, which thenceforward resists all pressure as a liquid would.

If, now, the pressure be slowly diminished, one perceives that at a pressure constant for determinate temperatures the liquid suddenly reappears; a thick mist is produced, developing and vanishing in an instant, and marking the level of the liquid which reappears. The following numbers indicate the progress of the phenomenon.

Operating with a mixture formed approximately of 5 volumes carbonic acid and 1 volume air, the liquid carbonic acid reappears at:

Atmospheres.		Degrees.
132	at the temperature of +	5·5
124	"	10
120	"	13
113	"	18
110	"	19

The carbonic acid compressed above 350 atm. no longer liquefies at 21

This phenomenon of disappearance of the liquid cannot be explained by the heat disengaged by compression; for, in this experiment the tube is immersed in water, which keeps the temperature constant, and the compression is effected slowly enough for the cooling to be always complete.

The whole phenomenon, indeed, is as if, at a certain degree of compression, the carbonic acid is diffused in the gas above, producing a homogeneous matter, without sensible change of volume; and nothing seems to hinder us from supposing that the gas and the liquid are dissolved in one another. I have tried to verify this hypothesis by coloring the liquefied carbonic acid. Of all the substances tried, iodine alone was capable of dissolving in the acid; but, unfortunately, in this experiment the mercury is rapidly attacked, and the phenomenon is immediately masked by the iodide of mercury, which is deposited on the wall of the tube.

One might, however, suppose that the disappearance of the liquid is only apparent; that the index of refraction of compressed air, increasing more quickly than that of the liquid carbonic acid, there comes a moment when the two indices becoming equal, the surface of separation of the liquid and the gas ceased to be visible. But if, then, we augment several hundred atmospheres the pressure of the system, the surface of separation of the gas and the liquid should become visible again, the index of refraction of the gas continuing to increase, by hypothesis, more rapidly than the index of the liquid. But experiment, pushed to 450 atmospheres, gave only negative results.

We may, then, suppose that at high pressures a gas and a liquid may be dissolved in one another, so as to form a homogeneous whole.

An Englishman's Views on American Manufactures.

In a lecture recently delivered in Sheffield, England, Mr. W. K. Marples, of that town, related his experience and observation in his travels through the United States.

"I found," says the lecturer, "in visiting various American factories, machinery much more generally used than it is with us—in fact, I sometimes saw machinery employed for a process which might have been done more cheaply by hand labor; but we must remember that until recently skilled workmen were not numerous in the States, and so manufacturers were driven to the use of machinery. The Americans are much more advanced in manufactures of all kinds than many of us are aware. Cabinet furniture, glass and china, cutlery tools, guns and pistols, agricultural implements, carpets, linen, in fact, soft and hard goods of every description are made, and in most instances made well, in the United States. Their resources are wonderful; nature has given them coal, iron, waterpower, etc., with the finest navigable rivers in the world, and then their chiefly English origin has given them pluck, endurance, and perseverance under difficulties, and these qualities, coupled with the immigration of many of our best artisans, have in the comparatively short space of 100 years worked marvels for them. The New England States are one vast hive of manufacturing industry, and it is here that the brains of inventors are stimulated to their utmost powers in developing labor-saving articles, and the machinery to make them.

"I think the introduction of the many American ideas and inventions into England that has been attempted during the past few years will tend to develop new ideas among our workpeople, and assist us in holding our position as the great manufacturing nation of the world. I have little fear that English hardware manufacturers will succeed in holding their own in all markets where the duties are not prohibitory, as in the United States. There is little doubt that much of the boasted superiority of American manufactures in the matter of price was a mere myth, and I am fully convinced that until a few months ago, when the hardware trade in America was so depressed, the manufacturers there exported goods to England at a positive loss. In some cases this has been admitted, and the enormous advances, amounting in some goods (notably in locks) to over 100 per cent, bear me out in this opinion. Many goods, that up to a short time ago were imported from America, are now manufactured in England, and the Americans would seem to be doing their best to destroy the trade which until recently they were apparently so anxious to build up. English manufacturers have been fully alive to the situation, and will not readily allow American manufacturers to recover the ground they are now losing."

The Railways of London.

A London paper states that the rails used by the companies within a radius of 6 miles of Charing Cross would form a single line from London to John O'Groat's house, a distance of 750 miles. This estimate does not include the rails in bays and sidings, but it includes all double, treble, or quadruple tracks. Leaving all duplicate lines aside, the incredible number of 260 miles of railway is in daily operation in the metropolitan district. From Hendon and the Alexandra Palace on the north to Penge and Streatham on the south, from Forest Gate and Woolwich on the east to Acton and Willesden in the west, thirteen different companies hold sway, not including the East London, whose line is worked by another company. There are also six short lines, varying from 4¾ miles to 1 mile in length, owned and worked by the companies jointly. The Brighton Company owns the greatest mileage in the metropolis—37 miles. It is closely run by the Great Eastern with 32. Then comes the London and Southwestern with 27; the London, Chatham and Dover and Northwestern follow with 24 each. So far as using the lines are concerned, the London and Northwestern run over more than one-fourth of the whole metropolitan system. The trains of this great company use the lines of five other companies, practically adding 44 miles to their own system. The Great Northern has running powers over the lines of six companies, embracing 36 miles. The mixed nature of the metropolitan system is apparent in the fact that over the London, Chatham and Dover Railway five companies run their trains. The Metropolitan Company's lines are open to four companies. The Southeastern alone uses no other lines, though it has running powers over the East London. If there be added to this astonishing system of locomotion the 70 miles of tramways now open, the omnibuses which ceaselessly traverse the metropolis from one end to the other, the thousands of cabs, the passenger steamers which ply on the river—the magnitude of the means daily employed by the people of London in getting from one part of the "New Babylon" to another will strike the observant mind. With all this vast traffic the injuries to life and limb, save in the cases of street accidents, are comparatively few. With trains flying above ground and underground, over complicated points and through crowded junctions, collisions seldom occur and seldom result in loss of life.

© 1880 SCIENTIFIC AMERICAN, INC

THE LITERARY REVOLUTION.—HISTORY.

On another page will be found advertised Macaulay's England, in three volumes, Knight's England, in four double volumes, Gibbon's Rome, in five volumes, and other standard histories, at prices which place them within easy reach of thousands who could never before reconcile their literary longings with their scanty belongings. The prices are now the marvel. At first readers doubt if they are real; then if the books are well made; for no previous experience shows that books can be at once good and cheap. When actual inspection demonstrates that they are well printed from good type, on fair white paper, and are bound neatly and durably, then the marvel is that the thing can be done For the publishers deny that they are giving their wares away. They have simply adopted a system by which the eager crowd that wants their books get with them whatever advantage may accrue from large editions, cash sales, and the abrogation of the long series of intermediate profits that usually lie between the maker and the buyer.

Type setting by steam lends its aid. The compositor sits before his lettered key-board like an organist at his desk; the types, responsive to the call of his deft fingers, step out into the ever-growing file, whence a second workman takes the ranks that march in solid column down the printed page. Brains guide this machine, but the distributer is entirely automatic, assorting the letters swiftly with the utmost precision.

Although history is prominent in this advertisement, the issues of the AMERICAN BOOK EXCHANGE include many other works of standard merit. Descriptive catalogues of books now ready, and of important additions to be made at no distant day, will be cheerfully sent to any address. —*Adv.*

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

Send stamp for Illustrated Descriptive Price List of the Step Ladder, Ironing Table, and Clothes Drier. An ingenious combination. Useful in hotels, laundries, and every household, in every climate. See description in No 12, Vol. 42, SCIENTIFIC AMERICAN. J. H. Martin, Hartford, New York.

Best and cheapest Piston Water Meter; also machines for setting tires cold by hand or power. Send for circular. J. B. West, Rochester, N. Y.

Wanted—30 H. P. Portable Engine; new or 2d hand. Address Colman Bros., South Coventry, Conn.

Makers of Thermo-static Apparatus for Controlling Valves, address A. Stamm, Box 1998, Leadville, Col.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., sole manufacturers, Fitchburg, Mass.

Wanted—Straw Braiding Machines for Hats, Mats, or Bonnets, and Hand Knitting Machines. Address 374 Atwater St., Detroit, Mich.

The handsomest Pens made are the Gold Plated Pens by the Esterbrook Steel Pen Co., 26 John St., New York. Price $2 per gross.

Catalogue of Useful Books on Applied Science sent free. E. & F. N. Spon, 446 Broome St., New York.

Telephones.—Inventors of Improvements in Telephones and Telephonic Apparatus are requested to communicate with the Scottish Telephonic Exchange, Limited, 34 St. Andrew Square, Edinburgh, Scotland. J. G. Lorrain, General Manager.

Makers of Machines for making Wagon Spokes, Rims, etc., address C. D. Rathbone, Belpre, Ohio.

Blake Lion and Eagle Imp'd Crusher. See adv. p. 236.

Wanted.—Foreman of Machine Shop; one accustomed to fitting hardware or light work; also Metal Pattern Maker, familiar with the gating of small patterns. Apply to St. Louis Malleable Iron Co., St. Louis, Mo.

The genuine Asbestos Roofing (with white or gray Fireproof Coating), now in use in all parts of the world, is the only reliable substitute for tin. It is adapted for steep or flat roofs in all climates. It costs only half as much as tin, and can be easily applied by any one. H. W. Johns Manufacturing Co., 87 Maiden Lane, sole manufacturers.

Experimental Machinery, prices fair, at Anderson Bros., Peekskill, N. Y.

For manufacturing sites, coke and gas coal lands, their qualities and prices, address Mellon Brothers, Pittsburg, Pa.

Foundry and Machine Shops for sale. Established in 1846. Write for description to E. J. Hoen, Addison, Steuben Co., N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 220.

Wanted—Glass and Tin Fruit Cans; large quantities. Send price lists to E., Buff Bay, Jamaica, West Indies.

Brass Castings; bottom prices. H.B.Morris, Ithaca, N.Y.

For Alcott's Improved Turbine, see adv. p. 204.

Boiler Feed Pump, with tight and loose pulleys; sure to work. Price $32. York & Smith, Cleveland, O.

Boat Engines, for sidewheel boats drawing 6 to 12 in; direct acting; link motion; cheap. Box 559, Owego, N.Y.

For Sale.—Four Boilers, 100 horse power each, return drop flue; A 1 condition; $1,500 each. 1 Berryman Heater, 42 x 96; A 1 condition; $400. D. L. Einstein, 16 White St., New York.

Corrugated Traction Tire for Portable Engines, etc. Sole manufacturers, H. Lloyd, Son & Co., Pittsburg, Pa.

Spokes and Rims, white oak and hickory, best quality, to any pattern, and Hammer Handles of best hickory. John Fitz, Martinsburg, West Va.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 238.

Forsaith & Co., Manchester, N. H., & 213 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T.Shaw, 915 Ridge Ave. Phila.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Portable Forges, $12. Roberts, 107 Liberty St., N. Y.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Eclipse Portable Engine. See illustrated adv., p. 222.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Silent Injector, Blower, and Exhauster. See adv. p. 238.

Steam Engines, Boilers, Portable Railroads, Sugar Mills. Atlantic Steam Engine Works, Brooklyn, N. Y.

Planing and Matching Machines, Band and Scroll Saws, Universal Wood-workers, Universal Hand Jointers, Shaping, Sand-papering Machines, etc., manuf'd by Bentel, Margedant & Co., Hamilton, Ohio. "Illustrated History of Progress made in Wood-working Machinery," sent free.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien M'f'rs, 23d St., above Race, Phila., Pa.

Peck's Patent Drop Press. See adv., page 236.

Chase's Pipe Cutting & Threading Machine. Send for circular. Chase Machine Co., 120 Front St., New York.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 205.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 237.

We will purchase or manufacture on royalty, patented articles of real merit. Farley & Richards, Phila., Pa.

Valve Refitting Machine. See adv., page 238.

Cut Gears for Models, etc. Models, working machinery, experimental work, manufacturing, etc., to order. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of last week.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 238.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

Inventors' Institute, Cooper Union. A permanent exhibition of inventions. Prospectus on application. 733 Broadway, N. Y.

For Reliable Emery Wheels and Machines, address The Lehigh Valley Emery Wheel Co., Weissport, Pa.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 108.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

New Economizer Portable Engine. See illus. adv. p. 206.

Cutters shaped entirely by machinery for cutting teeth of gear wheels. Pratt & Whitney Co., Hartford, Conn.

Hand Fire Engines, Lift and Force Pumps, for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N.Y., and 98 Liberty St., N. Y. city, U.S.A.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 236. Totten & Co., Pittsburg.

NEW BOOKS AND PUBLICATIONS.

DEUTSCH-AMERIKANISCHE APOTHEKER-ZEITUNG. A semi-monthly gazette devoted to the interests of Apothecaries, Physicians, Chemists and Druggists. New York: Pharmaceutical Publishing Company, 5 Gold street. Price $2.50 a year.

The first issue of this new periodical is well printed on Roman type, and contains a number of articles of interest and value to German reading apothecaries and druggists, a price list of drugs and chemicals, and a report of the drug market. It has sixteen pages about three-fourths the size of the SCIENTIFIC AMERICAN, and bears evidence of ability and vitality enough to give it an honorable rank among trade journals.

RESPONSIBILITY RESTRICTED BY INSANE DELUSION. By T. L. Wright, M.D. Paper, pp. 16. Reprint from Cincinnati *Medical News*.

Dr. Wright's conclusions are that the partially insane should be held responsible for crime; that the degree of responsibility attaching to the acts of the monomaniac is less than that which belongs to sound minds; and that capital punishment should never be visited upon one infected with any taint of lunacy.

THE AMERICAN HOUSE BUILDER. By R. G. Hatfield. Edited by O. P. Hatfield. New York: John Wiley & Sons. 8vo, cl., pp. 685. Price $5.

This is the eighth edition of the well known treatise on the art of building by the late Mr. Hatfield. During the last year of his life the author thoroughly revised his work and rewrote a large part of it, making many additions. The new volume is published in the same style as the author's work on "Transverse Strains."

KEY TO GHOSTISM. SCIENCE AND ART UNLOCK ITS MYSTERIES. By Rev. Thomas Mitchell. New York: S. R. Wells & Co.

A curious book which, while it exposes in a way the absurdities of "ghostism," still seems to leave the author in a mental condition scarcely more creditable than that of the victims of the delusion he combats. The science of the work is of that amazing kind which has not even a ghost of the spirit of true science about it, let alone any material basis.

UBER DIE VERWERTHUNG DER LINIEN GLEICHER HOHE FUR BERGBAU. Forst-, Land-, und Volkswirthschaft und deren Wichtigkeit für die Fruchtfarkeit und den Wasserreichthun sowie den Verkehrlines Landes. Von K. Ludolff. Prague: H. Dominicus. Pp. 32. 1878.

Treats of the use of lines of equal height in mining, forest culture, national economy, etc., meaning by the term, lines following the contour of the earth's surface, but always preserving the same level. For example, to maintain the level of a mill race or aqueduct without viaducts or tunnels, the channel must be carried around all the curvatures of hill and valley, its course forming a line of equal height. The author points out the applications and usefulness of such lines in the several varieties of engineering work.

ARCHIMEDES' LEVERS: THE FULCRUM FOUND BY WILL POWERS. Philadelphia: G. W. Townsend.

A packet of slips of note paper, along the margins of which are printed these words: 1. The Cause or Source? 2. Its Essentials? 3. Associated with? 4. Its Incidents? 5. It Illustrates? 6. Its Effects? 7. Conclusions? These seven "levers" the student is expected to use in the analysis of subjects suggested or taught in newspaper articles, books, etc. Habits of critical notetaking are well worth cultivating; and these slips might be handy for such work. The suspicion, however, that the author has experimented with the "levers" and thereby acquired the style of writing and thinking shown by him on the cover of the packet, will be likely to prevent any large use of them.

THE FIELD ENGINEER. By William Findlay Shunk, C. E. New York: D. Van Nostrand.

A handy (pocket) book of practice in the survey, location, and track work of railroads, prepared with special reference to the wants of young engineers who have not had the advantage of a technical education.

A PRACTICAL TREATISE ON NERVOUS EXHAUSTION (NEURASTHENIA), ITS SYMPTOMS, NATURE, SEQUENCES, AND TREATMENT. By George M. Beard, M.D. New York: William Wood & Co.

Dr. Beard writes as a specialist for the practical instruction of general practitioners of medicine, his aim being, in his own words: To describe with thoroughness, if not exhaustively, the symptoms of neurasthenia—those hitherto assigned to other affections, or regarded as special and distinct diseases, to show their relations and interdependence; to distinguish them from the oftentimes closely resembling symptoms of organic disease on the one hand, and the symptoms of hysteria and hypochondria on the other; to unify and harmonize the complex developments and manifestations of this malady; to indicate its pathology and rationale; and to trace out in detail its prognosis, sequences, treatment, and hygiene. "The hygiene of nervous diseases has three gospels—rest, work, and change of work."

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) G. W. D. asks: What is the rule for determining the size of steam ports, the area of piston being known? A. Generally from one-ninth to one eighteenth the area of the piston, depending upon the pressure of steam and velocity of the piston.

(2) W. T. B. asks: Which has the most brains, the best chemist in the world or the best carpenter? A. We do not know of any carpenters who have ranked so high as the "best chemists," on the score of brain, capacity, power, and learning. Certainly chemistry calls for a higher and wider range of exact knowledge and greater mental power and acuteness than carpentry does; and for quite as much manual skill.

(3) L. H. McF. asks: 1. Ought pure alcohol be used for preserving natural history specimens? A. Spirit of wine will answer as well as strong alcohol. 2. Will methylic or wood alcohol answer the purpose? A. Yes; in some cases alcohol is preferable.

(4) O. R. R. asks: 1. Is there any way known of keeping milk without retaining it somewhat in bulk? A. Milk has been preserved for some time by the addition to it of salicylic acid in the proportion of ten or twelve grains to the quart; also by the use of iodate of calcium. Neither of these, however, are desirable in milk. 2. If a method could be discovered by which this could be done would it be of any great value? A. Very probably.

(5) R. S. M. asks: 1. If a pipe be laid five miles long over hills and down valleys, the fall being ten feet to the mile, or 50 feet total, and the pipe be kept full of water at the upper end, would the pipe be full at the lower end? I say not: am I right? A. If we understand your question, you are correct. 2. Would not the water all pass through a pipe one half the size, the last, say, 100 feet? If not, what proportion? A. The size of pipe at the lower end, to discharge all the water supplied from the upper end, will depend upon the total length of the pipe, and the number and character of the bends. 3. Would not the water flow more freely on a gradual grade than moving up and down with the hills? A. Yes.

(6) E. H. W. writes: In your issue of the SCIENTIFIC AMERICAN of March 20, under the head of "Notes and Queries," No. 22, S. G. asks about making a small engine cylinder of Babbitt metal. You directed him to use a piece of brass tubing instead, which corresponds with my idea of a small cylinder. I just successfully completed an engine a few weeks ago, cylinder 1 3-16 inches diameter by 2½ inches stroke, with brass tube for bore of cylinder, and with Babbitt metal cast around it in the form necessary. It is a slide valve engine. Have not applied it to any machinery yet, but feel confident it will run several sewing machines at once.

(7) S. B. H. asks: Can the chemicals and impurities of a negative bath be identified by the help of a microscope, either in the solution or after evaporation? A. The microscope would be of little service in this connection.

(8) W. E. A. writes: I have been trying to make an imitation amber, for manufacturing purposes, but can't get it just right. Can you give me a formula or some hints in regard to it? A. A fictitious amber is prepared by melting pure bleached shellac, and keeping it over the fire until it runs clear, with care to prevent burning. It may be poured into moulds of the size of pieces required. The operation requires considerable management. The darkest and hardest pieces of gum copal are also substituted for amber. The copal may be fused with the shellac.

(9) I. P. asks: 1. How many pounds of cast iron can I melt in a crucible in a brass furnace? A. 10 or 12 lb. can be handled very well. 2. How many melts can I make in a crucible before danger of cracking? A. If carefully handled, two or three. 3. What must I use for a flux for cast iron? A. A little borax, or charcoal and carbonate of soda. These are not essential. 4. What can I add to scrap to make a soft casting? A. Powdered iron ore—iron rust.

(10) G. P. P. asks (1) where to find directions for making a small electric motor. A. In article on "An Electrical Cabinet" in SUPPLEMENT No. 191. 2. How can I make an Edison loud speaking telephone? A. See p. 198, vol. 41, SCIENTIFIC AMERICAN. 3. What is the chemical reaction when the solution for chemical telegraph is decomposed by electricity, the positive electrode being of iron? (The solution is the same as described on page 124 (24), Vol. 41, SCIENTIFIC AMERICAN.) A. Ferric oxide is formed, which combines with the potassium ferrocyanide forming Prussian blue ($Fe_7\ Cy_{18}$).

(11) H. A. R. asks how to make the best stove polish. A. Use pure graphite (plumbago) reduced to a fine powder and made into cakes by strong pressure.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

S. P.—The mineral is a micaceous hematite; it is a valuable ore of iron readily mined and in large quantities.—J. D. C.—No. 1 is a good sample of argentiferous galena. The property is probably valuable. No. 2 is carbonate of lime.—M. F. B.—The sample is fool's gold and contains none of the precious metals.—J. L H.—The substance is mica and if in larger plates would find a ready market.—T. X. O.—No. 1 is a lead carbonate carrying silver. An assay would be advisable. No. 2 is decomposed granite.—L. S.—The ore is evidently a selected specimen. It is worth about $200 per ton.—R. C. G.—They are not diamonds but quartz pebbles. No. 2 is worn by water. No. 3 is not a mineral but a fragment of shell.—H. H. B.—The substance is a green marl and is much used as a fertilizer.—J. B. S.—It is not malachite but hardened green paint.—R. & Co.—Sample in green box. No. 1 is iron pyrites in shale. No. 2 is chrome iron ore.—M. E. C.—Copper and iron sulphurets probably carrying a little silver.—J. H. V.—Quartz, iron sulphide, fluorspar. An assay would be necessary to ascertain the presence or absence of the precious metals.

COMMUNICATIONS RECEIVED.

On Cotton Pickers. By I. J. M.

On Spontaneous Combustion. By J. T. R.

On Perpetual Motion. By H. S. B.

© 1880 SCIENTIFIC AMERICAN, INC

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

March 16, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, or any patent issued since 1867, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Animal trap, A. McClain ... 225,624
Animal trap, J. H., W., & T. D. Morris ... 225,628
Anvil and vise, combined, W. E. Canedy ... 225,563
Apple grinders, pressure plate for, Boomer & Boschert ... 225,456
Auger, earth, A. J. Collins ... 225,508
Auger, hollow, E. C. Stearns ... 225,496
Bale tie, cotton, S. H. Gilman ... 225,517
Bedstead, invalid, P. F. Adams ... 225,455
Boilers to prevent incrustation, device for feeding fluid into, W. Linehan ... 225,622
Boot, R. Church ... 225,569
Bottle and glass stopper, glass, R. P. Smith ... 225,654
Bottle stopper, C. G. Hutchinson ... 225,476
Bottling machine, C. G. Hutchinson ... 225,475
Bracelet, J. Sweet ... 225,661
Brick, pottery, etc., kiln for burning, N. B. & E. M. Heafer ... 225,598
Bridges, guard gate for swing, Roehr & Jeyte ... 225,535
Bung, beer, A. Fuldner ... 225,515
Burglar alarm, S. D. Houpt ... 225,606
Burglar alarm, percussion, W. H. Reiff ... 225,534
Burglar alarm, portable, W. H. Reiff ... 225,641
Buttons, etc., from plastic materials, manufacture of, W. L. Palmer ... 225,688
Buttons, etc., manufacture of, Bliss & Badger ... 225,556
Car brake, railway, J. R. Jones ... 225,611
Car coupling, O. H. Drinkwater ... 225,578
Car coupling, J. S. Fisher ... 225,583
Car coupling, J. Heffner ... 225,599
Car coupling, J. N. Winn ... 225,675
Car, stock, T. Clarke ... 225,507
Car, stock, G. F. Patterson ... 225,486
Car wheel chill, J. N. Barr ... 225,549
Carriage bolts, die for making, I. Newton ... 225,532
Carriage dash frame, B. J. Warden ... 225,669
Carriage top, landau, H. Lines (r) ... 9,117
Cartridge, M. Coloney ... 225,463, 225,464
Cartridge primer, J. H. Gill ... 225,591
Casting rolls, E. L. Lamb ... 225,479
Catapult, O. H. Curtis ... 225,510
Centrifugal machine, S. S. Hepworth ... 225,600
Centrifugal machine, T. H. Muller ... 225,631
Chandelier, extension, A. H. Jones ... 225,612
Child's chair, W. F. Barber ... 225,548
Churn, L. W. Leake ... 225,620
Churn dasher, W. D. Snell ... 225,655
Churn motor, J. P. Rogers ... 225,644
Cloth rolling machine, A. Brown ... 225,557
Cock handles, covering for steam, J. Morrison ... 225,481
Comb frame tongs, A. Hansen ... 225,519
Commode, P. Shinkle ... 225,649
Cooker and drier, steam feed, T. E. Daniels ... 225,511
Cooker, steam, W. G. Flanders ... 225,584
Corset clasp, O. C. Haskell ... 225,520
Corset parts, machine for folding, A. B. Curtis ... 225,574
Crate, G. E. Bender ... 225,551
Creamer, S. S. Weldon ... 225,672
Cultivator, corn, G. R. Johnson ... 225,526
Curtain roller, Fisher & Gamble ... 225,582
Dam or sluice weir, clough, A. Pasqueau ... 225,533
Dental jaw brace, G. H. Hurd ... 225,525
Disintegrating mill, L. J. Bennett ... 225,552
Distilling oil, apparatus for, P. Nicolai ... 225,635
Ditcher and scraper, combined, G. Palmer ... 225,637
Ditching machine, C. D. Edwards ... 225,579
Ditching machine, W. Stacy ... 225,657
Drawer pull, G. L. Donovan ... 225,576
Earthenware saucepan, M. Schott *et al.* ... 225,492
Egg holder, J. McGlinchy ... 225,530
Eggs, composition for preserving, A. Good ... 225,518
Elevator, J. A. Groshon ... 225,473
Elevator and carrier, combined, A. A. Munson ... 225,630
Elevator and fountain, A. A. Sanford ... 225,646
End board fastening, C. F. & E. E. Whipple ... 225,544
Engraving printing surfaces, M. Bradley ... 225,457
Envelope, J. D. Terry ... 225,540
Fare box, W. H. Hornum ... 225,605
Feed mill, L. J. Caldwell ... 225,562
Feed water heater and steam generator, C. D Smith ... 225,537
Fence builder, wire, W. A. Newton (r) ... 9,120
File, bill and letter, G. V. Nauerth ... 225,632
Firearm, magazine, Tiesing & Kennedy ... 225,664
Flour, etc., apparatus for bolting, Shuttleworth & Morse ... 225,536
Fruit gatherer, J. N. Jarman ... 225,610
Furnace grate, W. Gillespie ... 225,590
Gate, M. C. Doolittle ... 225,512
Glass, etc., machine for grinding, Lake & Weller ... 225,619
Governor, W. E. Crane ... 225,573
Grain cargoes, device for preventing the shifting of, W. E. Ferguson ... 225,581
Grain drill teeth, detachable point and fastening for, W. H. Wilson ... 225,674
Grain drill teeth, mechanism for adjusting, W. Q. Prewitt ... 225,640
Grain rick frame, C. Geiger ... 225,589
Grate bar, E. Haycox ... 225,521
Griddle, cake, I. W. Snyder ... 225,656
Grinding wheels, composition for, C. E. Stevens ... 225,658
Gun, machine, M. Coloney ... 225,462, 225,466
Harness maker's stitching horse, C. A. Holland ... 225,604
Harrow and clod crusher, F. Nishwitz ... 225,634
Hog and cattle vat, E. Ellis ... 225,514
Holdback, vehicle, G. W. Hinkle ... 225,603
Horse quarter boat, E. Barnard ... 225,547
Horse rake, H. C. Herchelrode ... 225,602
Hub, vehicle wheel, G. Tozer ... 225,498
Hydraulic engine, J. H. Kane ... 225,614
Ice cream freezer, Patterson & Hayes ... 225,487
Ice cream freezer, Winn & Winship ... 225,676
Ice pick, C. S. Watson ... 225,670
Ironing table, C. F. W. Seidel ... 225,648
Jetty, portable sectional, J. Grant ... 225,592
Key ring, B. H. Melendy ... 225,626
Lamp, O. Sweeney ... 225,662
Lamp body, J. Kintz ... 225,615
Lamp burner, K. H. E. Hoyby ... 225,524
Lamp, electric, J. H. Guest ... 225,594
Latch, gate, S. B. Elzey ... 225,580
Locked switch, J. W. Reinhart ... 225,643
Loom shuttle, N. J. Willis ... 225,673
Loom shuttle motion, I. G. Chandlee ... 225,566
Looms, pile wire mechanism for, G. Dixon ... 225,469
Marble, ornamentation of furniture, J. Berkey ... 225,505
Marble veneering, T. C. Lamb ... 225,618
Measuring device, tailor's, H. H. Woolson ... 225,678
Meat packing device, E. Detwiler ... 225,467
Middlings purifier, Case & Stein ... 225,564
Mining machine, coal, D. W. Siprell ... 225,494
Mower, H. A. Howe ... 225,607
Mowing and reaping machine, C. Taylor ... 225,663
Music leaf turner, F. L. Becker ... 225,550
Nailing machine, A. Knowlton ... 225,527
Nailing machine, hand, S. E. Mower ... 225,482
Ordnance, breech-loading, M. Coloney ... 225,461
Ore crusher, T. R. Timby ... 225,665
Paddle for boat wheels, J. L. Cheston ... 225,567
Paddlewheel, J. Sherry ... 225,493
Paper bag machine, W. C. Cross ... 225,509
Paper, blank music, H. L. Hastings ... 225,596
Paper damping machine, W. Scott ... 225,491
Paper folding machine, Chambers & Mendham ... 225,506
Paper machine jacket stretcher, J. Jamison ... 225,609
Peanut roaster, W. H. Burk ... 225,561
Peanut stripper, J. T. Jones ... 225,613
Peg rasping machinery, W. B. Arnold ... 225,504
Permutation lock, C. J. Reno ... 225,490
Photographic images, producing, D. N. Carvalho ... 225,458
Photographic pictures, producing, W. Kurtz ... 225,478
Pipe crimping machine, F. R. Packham ... 225,636
Piston, steam engine, E. M. Birdsall ... 225,555
Pitman connection, W. F. Rundell ... 225,645
Planter, corn, P. S. Lutz ... 225,528
Planter, corn, B. T. Stowell ... 225,660
Plastic compound, A. T. Woodward ... 225,679
Pliers, parallel, E. N. Parker ... 225,485
Plow, sulky, F. J. Smith ... 225,538
Plow, sulky, G. H. Warren ... 225,668
Post and pile driver, W. A. Newton (r) ... 9,119
Printing machine, chromatic, G. M. Wright ... 225,501
Printing press sheet delivering apparatus, S. D. Tucker ... 225,666
Projectile, H. H. Sibley ... 225,650
Pump, J. A. Pease ... 225,488
Pump valve, steam, M. F. De Souza ... 225,575
Railway switch lever, S. B. Nickum ... 225,483
Refrigerator, Hale & Ramsey ... 225,595
Refrigerator, Moseley & Koch ... 225,629
Registering apparatus, Bennor & Pond (r) ... 9,118
River banks, device for protecting, Hedges & Needham ... 225,522
Ruffled fabrics, machine for pressing or creasing, W. Walker ... 225,667
Safe for provisions, etc., D. N. Smith ... 225,653
Sash fastener, J. W. Todd ... 225,541
Sash lock and lift, E. J. Brooks ... 225,558
Sash, window, D. W. Clark ... 225,570
Scales, pendulum, P. Evens, Jr ... 225,513
Scoop shovel for unloading cars, J. S. Metcalf ... 225,531
Seaming machine, F. A. Walsh ... 225,500
Semiphore, electric railway, J. Nesbitt ... 225,633
Service box, junction, S. E. Babcock ... 225,546
Sewing machine, J. E. Bertin ... 225,553
Sewing machine, button hole, J. H. Brown ... 225,559
Sewing machine motor, J. V. Morton ... 225,627
Sewing machines, presser foot and cord guide for button hole, T. S. L. Howard ... 225,523
Shaft and sheath, flexible, W. H. Gates ... 225,516
Sheet metal can, F. A. Walsh ... 225,499
Shell, time, M. Coloney ... 225,459
Shells, torpedoes, etc., time firing mechanism for, M. Coloney ... 225,460
Shirt, J. H. Kirkpatrick ... 225,616
Shoe fastening, W. Kraemer ... 225,477
Shoe holder and box draw, comb'd, C. A. Simonds ... 225,652
Shutter fastener, C. Garlick ... 225,470
Sign, transparent, H. Child ... 225,568
Sink trap, E. W. Anthony ... 225,503
Soldering apparatus, can, F. Westerbeck ... 225,543
Spark arrester, G. B. F. Cooper ... 225,572
Spoons, device for plating, P. Concannon ... 225,571
Steam boiler and furnace, E. H. McNiel ... 225,625
Steam engine, S. N. Silver ... 225,651
Steam generator, King & Drake ... 225,617
Steam generator, M. N. Lovell ... 225,480
Steam heater, S. F. Gold ... 225,472
Stove attachment, magazine, R. Hatchman ... 225,597
Stove, coal oil, W. B. Billings (r) ... 9,12
Stove grate, W. McClave ... 225,623
Stove, heating, O. W. Noble ... 225,484
Straw cutter gearing mechanism, J. Weichhart ... 225,671
Sugar moulding machine, C. H. Hersey ... 225,601
Suspender end, T. O. Potter ... 225,639
Tap valve, M. G. Gillette ... 225,471
Target ball, Ligowsky & Woeber ... 225,621
Telegraph signal box, fire alarm, J. M. Gardiner ... 225,588
Testing machine, G. Matheson ... 225,529
Thill coupling, H. Albers ... 225,502
Thrashing machine sieve protector, T. J. Hubbell ... 225,608
Tool, combination, C. S. Garrigus ... 225,587
Torpedo, marine, M. Coloney ... 225,465
Traction engine, Brown & Hoag ... 225,560
Trucks, safety hook for car, L. B. Stilson ... 225,659
Trunk, cross slatted, C. A. Taylor ... 226,497
Tube making machine, P. Reilly ... 225,642
Tubes, machine for corrugating metallic, S. Fox ... 225,586
Turbine gate, J. H. Staples ... 225,495
Type setting and distributing machine, P. Dillon ... 225,468
Valve, cylindrical, F. Winters, Jr ... 225,677
Velocipede, railway, W. H. Fox ... 225,585
Washing machine, M. C. Greenland ... 225,593
Washing machine, J. F. Schlossstein ... 225,647
Watch stem winding and setting attachment, P. A. Vuille ... 225,542
Water motor, D. Drawbaugh ... 225,577
Water tank attachment, A. B. Castle ... 225,565
Wheat drill, S. Williams ... 225,545
Whip socket, H. B. Pitner ... 225,489
Wind engine, R. E. Strait ... 225,539
Windmill, M. Berdan ... 225,554
Wood cutting tool, F. Hanson ... 225,474

DESIGNS.

Carpet, W. J. Gadsby ... 11,681
Carpet, D. McNair ... 11,683
Carpet, T. J. Stearns ... 11,691
Envelopes, H. C. Bainbridge ... 11,686
Fork and spoon handles, W. C. Beattie ... 11,680
Glasses, etc., bases or supports for, H. L. Palmer ... 11,685
Stage scene, W. A. Mestayer ... 11,679
Stocking fabric, J. E. Hanifen ... 11,682, 11,690
Suspender ends, W. F. Osborne ... 11,684
Umbrella handles, Heiter & Lesem ... 11,687, 11,688
Watch crowns, E. Hunziker ... 11,689

TRADE MARKS.

Braid pins, A. Cook ... 7,853
Cheese, Neuenschwander & Co ... 7,854
Plows for breaking up and cultivating the soil, E. B. Whitman ... 7,852

English Patents Issued to Americans.

From March 12 to March 16, 1880, inclusive.

Coal picking and cutting machine, C. Morse, U. S. A.
Lamp, oil, R. Hitchcock *et al.*, Watertown, N. Y.
Music leaf turner, F. L. Becker, Galveston, Texas.
Paper, repulping process for, C. Coon *et al.*, Saugerties, N. Y.
Press regulator for water pipes, C. C. Barton, Rochester, N. Y.
Sewing machines, C. E. L. Holmes, New York city.

Advertisements.

Inside Page, each insertion ---75 cents a line.
Back Page, each insertion ---$1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

TRIUMPH MIDDLINGS MILL.
Under Runner, Iron Frame.
Mills changed from old to new process.
WILCOX, SHINKLE & MILLER,
Mill Furnishers,
PITTSBURGH, PA.
Established in 1848.

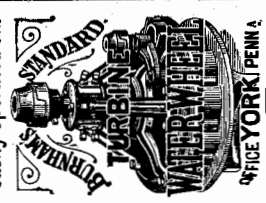
WANTED—A SECOND HAND ONE-HALF HORSE power Portable Engine; also, a small Electric Light Machine. Address, JAS. A. McELROY, Zanesville, O.

FOUR (4) DIFFERENT KINDS OF Cactus Plants (fine blooming) and five (5) valuable kinds of Seeds, sent free by mail for $1. Address H. FUCHS, Tiger Mills, Burnet Co., Texas, via Round Rock, Burnet and Sandy Mountain to Tiger Mills, Texas.

PEERLESS

Damper Regulator.
Superior in every respect to all other regulators. The greatest fuel-saving appliance ever invented. Insures safety from explosion. In ordering mention steam pressure. Illus. catalogue sent on application. We set it up and guarantee performance. Price, $75.00.
AMERICAN STEAM APPLIANCE CO.
18 & 15 Park Row, SOLE MANUFACTURERS, NEW YORK.

THE BUFFALO PATENT EXCHANGE will negotiate Patents; secure the manufacture of meritorious inventions; sell Novelties through active Agents; receive Models for Exhibition. Agents wanted.
W. S. SHAW, Manager, Buffalo, N. Y.

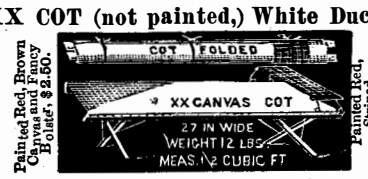


The gate is tight and easily operated on. Over 1,000 of these Wheels in operation in this and Foreign countries. *Pamphlet sent free.*

AGENTS Catalogue free. $7 per day made easy. J. F. GAGE & CO., Boston, Mass.

LEATHER BELTING OF THE BEST quality manufactured and for sale at the lowest market price, by SAMUEL ROBERTS, 108 Cliff Street, N. Y.

XX COT (not painted,) White Duck $2.


COT FOLDED
XX CANVAS COT
27 IN WIDE
WEIGHT 12 LBS
MEAS. ⅔ CUBIC FT
Painted Red, Brown Canvas and Fancy Bolster, $2.50.
Painted Red, Striped Canvas and Fancy Bolster, $3.00.

Makes a perfect bed. No mattress or pillows required. Better than a hammock, as it fits the body as pleasantly, and lies *straight*. Folded or opened instantly. Self-fastening. It is just the thing for hotels, offices, cottages, camp-meetings, sportsmen, etc. Good for the lawn, piazza, or "coolest place in the house." Splendid for invalids or children. Sent on receipt of price, or C. O. D. For **50 cts. extra,** with order, I will prepay expressage to any railroad station east of Mississippi River and north of Mason and Dixon's line. For **75 cents,** in Minnesota, Missouri, and Iowa.
HERMON W. LADD, 108 Fulton St., Boston; 207 Canal St., New York; 165 North Second St., Philadelphia. **Send for Circulars.**

AHEAD OF ALL COMPETITION!
1880.

EIGHT SIZES FOR HAND USE.
Weighing from 22 to 51 lbs.
THREE SIZES FOR HORSE POWER.
The *complete victory* and highest awards at the exhaustive Field Trial at the Paris World's Exhibition in 1878, together with those at the great hundred-day trial at the Centennial in 1876, prove that these machines fully maintain their reputation as the **best** Lawn Mower yet made. Do not buy worthless imitations when the genuine can be had for the same money.
GRAHAM, EMLEN & PASSMORE,
Patentees and Manufacturers.
631 Market St., Philadelphia, Pa.

FOR SALE.
Extra Strong Screw Presses, Calender Rolls, and other machinery connected with the manufacture of R. R. cards and tickets. This offers an excellent opportunity for any one desirous of a profitable business with an unlimited demand. Address GEO. BAILEY, 290 Pearl St., Buffalo.

WANTED.—Stationary Engine. 25 to 30 Horse. Resaw, Band and Mortising Machine, Exhaust Fan. THOMAS HIGGINS & SON, Vienna, Dorchester Co., Md.

AMERICAN JOURNAL OF INDUSTRY
Most widely circulated industrial journal in the Union. Try it three months, only $1.00. Advertisements and illustrations published at remunerative rates.
JOURNAL OF INDUSTRY CO., Pittsburg, Pa.

"Select List"

Geo. P. Rowell & Co.'s Select List of Local Newspapers.

Many persons suppose this list to be composed of CHEAP, low-priced newspapers. The fact is quite otherwise. The catalogue states exactly what the papers are. When the name of a paper is printed in FULL FACE TYPE it is in every instance the BEST. When printed in CAPITALS it is the ONLY paper in the place. The list gives the population of every town and the circulation of every paper. IT IS NOT A CO-OPERATIVE LIST. **IT IS NOT A CHEAP LIST.** At the foot of the Catalogue for each State the important towns which are not covered by the lists are enumerated. **IT IS AN HONEST LIST.**

An old advertiser writes: "I prefer the LOCAL LIST for the reason that, while but a few persons in any particular town subscribe for a class medium (or large city weekly) nine out of ten subscribe for their local paper, and the tenth one borrows it from his neighbor."

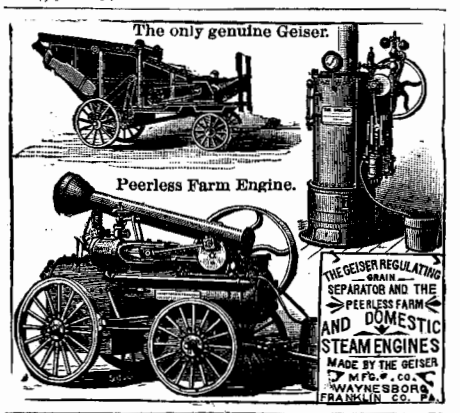
An advertiser, who spends upwards of $5000 a year and who invested less than $350 of it in this List, writes: Your Select Local List paid me better last year THAN ALL THE OTHER ADVERTISING I DID."

The rates charged for advertising are barely one-fifth the publishers' schedule. The price for single States ranges from **$2** to **$80.** The price for one inch one month in the entire list is **$650.** The regular rates of the papers for the same space and time are **$3,083. 16.** The list includes **997** newspapers, of which **193** are issued **DAILY** and **784 WEEKLY.** They are located in **807** different cities and towns, of which **28** are State capitals, **371** places of over **5,000** population, and **485** County Seats.

For copy of List and other information address

GEO. P. ROWELL & CO.,
Newspaper Advertising Agency,
10 Spruce St., New York.

SEND ADDRESS on a Postal Card for a list of new and second hand mechanical, scientific, phrenological, health, and miscellaneous books to be sold at about half price before removal to our new store. Address S. R. WELLS & CO., 747 Broadway, New York.


The only genuine Geiser.
Peerless Farm Engine.
THE GEISER REGULATING GRAIN SEPARATOR AND THE PEERLESS FARM AND DOMESTIC STEAM ENGINES
MADE BY THE GEISER MFG. CO.
WAYNESBORO, FRANKLIN CO., PA.

40 Skeins German Worsted, 21 Colors and Shades, 12 Perforated Mottoes, and over 100 New Designs for Worsted Work, postpaid by mail for only $1. Best dollar package ever offered. Worth about Three Dollars at Retail Prices. F. W. GARDINER, Lynn, Mass.

PROGRESS OF INDUSTRIAL CHEMISTRY.—By J. W. Mallet. The latest and most approved processes, and the latest experimental results in the manufacture of the following important commercial products: Niter, Potassium Chloride, Potassium Sulphate, Potassium Chlorate, Pyro-Chromate, Potassium Ferro-cyanide, Potassium Cyanide, Sodium Chloride, Sodium Nitrate, Sodium Sulphate, Borax, Ammonium Chloride, Calcium Chloride, Calcium Chlorate, and Magnesium Sulphate. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **214.** Price 10 cents. To be had at this office and from all newsdealers.

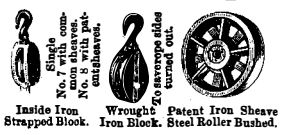
MAGNETIC REACTIONS.—BY THEO. du Moncel. An interesting and instructive paper, by one of the most eminent of French electricians, demonstrating that the effects of magnetism, like those of electricity, are of two different natures, according as magnets act as currents or as charges in the static state. Static action and dynamic action defined. How static magnetism is distributed in a simple magnetic system shown by magnetic phantoms. The effects which result from reactions exchanged between a magnet and its armature. Apparatus for showing this. Magnetism, from a static point of view, shown to behave like electricity in a condenser. Magnetic condensation. Remanent Magnetism, and how it differs from Condensed Magnetism. Illustrated with 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **217.** Price 10 cents. To be had at this office and from all newsdealers.

AN EASILY MADE SMALL, STRONG, AND CHEAP BOILER, for little Steamboats. By H. K. Stroud. With an engraving. This excellent little boiler is made of wrought iron mercury flasks, which may be readily obtained, ready for use. Seven flasks are screwed together with ordinary gas fittings. This boiler has been used for a year past, with much success, in the steam Sharpie yacht Mannelita. Length of boat, 16 ft. 5 in.; beam, 4 ft. 6 in.; propeller, 16 inches diameter. For further description of boiler, boat, and engine, with method of securing the propeller shaft in stern post, see SCIENTIFIC AMERICAN SUPPLEMENT, No. **182.** Price 10 cents. To be had at this office and of all newsdealers.

THE EAR.—BY CHAS. H. BURNETT, M.D. A valuable paper, giving a report of four cases, among many others, in which is shown the beneficial effect derived from the prolonged and uninterrupted wearing of cotton pellets as artificial drum-heads, and which the author claims are the only useful kind of artificial drum-heads that have ever yet been devised. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **217.** Price 10 cents. To be had at this office and from all newsdealers.

© 1880 SCIENTIFIC AMERICAN, INC

MACHINE KNIVES.
FOR PAPERMILLS, BOOK-BINDERS, WOOD WORKING AND AGRICULTURAL MACHY. ALSO PARALLEL VISES FOR MACHINISTS, PIPE FITTERS, BLACKSMITHS, WHEELWRIGHTS PATTERN MAKERS &C.
MANUFACTURED BY
TAYLOR STILES & CO.
REIGELSVILLE WARREN CO. N.J.


Single No. 7 with common sheaves.
No. 8 with patent lignum vitæ.
To save rope sides turned out.
Inside Iron Strapped Block.
Wrought Iron Block.
Patent Iron Sheave Steel Roller Bushed.

Pulley Blocks.
Iron Sheaves. Phosphor Bronze Self-Lubricating Bushings. PENFIELD BLOCK WORKS, Lock Box 99, Lockport, N. Y.

STEAM PUMPS.

HENRY R. WORTHINGTON,

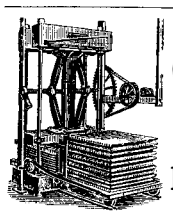
239 Broadway, N. Y. 83 Water St., Boston.
709 Market St., St. Louis, Mo.

THE WORTHINGTON PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations.

WORTHINGTON STEAM PUMPS of all sizes and for all purposes.

Prices below those of any other steam pump in the market.

WATER METERS. OIL METERS.



POWER
CIDER PRESS
WITH
DOUBLE PLATFORM.
Send for circular.
Boomer & Boschert Press Co.,
SYRACUSE, N. Y.

FREE Illustrated CATALOGUE of 1-Ct. Chromos, Watches, Revolvers and Novelties. CHEAPEST & largest assortment in the U. S. **SONGS**
E. F. NASON, 111 Nassau St., N. Y.

Photograph Visiting Cards. Circulars and 60 Samples for **10c.** SEAVY BROS., Northford, Ct.

PENNSYLVANIA LAWN MOWER.

Surpassing all others, and pronounced the best.

1880 1880

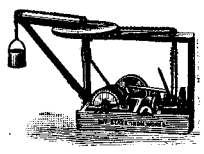
ADVANTAGES.

Lightness combined with strength.	Requires less repairs.
Runs more easily.	Cuts grass more smoothly.
Will cut longer grass.	Less liable to obstruction.
Is more durable.	Easily adjusted.
	No springs. Almost noiseless.

Every Mower warranted.

LLOYD, SUPPLEE & WALTON,
PHILADELPHIA.

Patent Steam Friction Crane



Will coal locomotive in three minutes. Two machines will load or unload 1,000 tons per day of coal or ore. The best and cheapest.

NOBLE & HALL,
ERIE, PA.

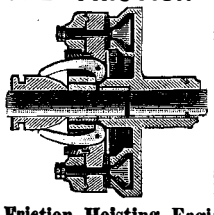
THE DINGEE & CONARD CO'S
BEAUTIFUL EVER-BLOOMING
ROSES
THE BEST IN THE WORLD.

Our Great Specialty is *growing* and *distributing* these **Beautiful Roses.** *We deliver* **Strong Pot Plants,** suitable for *immediate* bloom, *safely by mail* at all post-offices. **5 Splendid Varieties,** *your choice,* all labeled, for **$1; 12** for **$2; 19** for **$3; 26** for **$4; 35** for **$5; 75** for **$10; 100** for **$13.** ☞ Send for our **New Guide to Rose Culture**—60 pages, elegantly illustrated—and *choose* from over **Five Hundred Finest Sorts.** Address

THE DINGEE & CONARD CO.,
Rose Growers, West Grove, Chester Co., Pa.

50 Motto, Gold, Floral, Scroll, Snowflake Cards, **10c.** Agts. Samples, **10c.** Stevens Bros., Northford, Ct.

THE FRICTION CLUTCH CAPTAIN

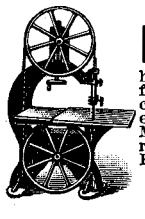


can be applied to all classes of machinery that is driven by fly-wheels and are liable to be broken by power stored up in wheel, such as calender rolls, upsetting machines, presses, and wire drawing machines. We can warrant to save gearing and all machinery from breaking by using our clutches. Starts gradual, stops quick. Any amount of power controlled.

Friction Hoisting Engines and Hoisting Drums, for line shaft and safety elevators. Can be run faster and stop quicker than any other friction.

D. FRISBIE & CO., New Haven, Ct.

THE No. 3
Eureka Band Saw



has advantages over any other manufactured. Is first-class in all respects, cheap, and durable. Also Pony Planers and Upright Shaping and Variety Moulding Machines, and a large variety of Wood Working Machinery. For particulars, address

FRANK & CO.,
Buffalo, N. Y.

EMERY WHEELS FOR SAW GUMMING.

Solid Emery Wheels are now in almost universal use for the purpose of gulletting and gumming Saws. Statistics show from 25,000 to 30,000 saw mills in the United States. Many of these run only a single saw each. A one-saw mill would use only one or two wheels a year, costing $3 to $4 each, and when such small mills order single Emery Wheels from the factory, the express charges often equal the cost of the wheel. There was a time when the quality of Emery Wheels was so uncertain, and the demand so fickle, that storekeepers could not afford to carry them in stock. Now, however, Saw Gumming Wheels have become as staple an article as Files, and EVERY DEALER IN SAWS, HARDWARE, AND MILL SUPPLIES can afford to carry a few dozen standard sizes in stock. Large dealers order stocks of $500 to $750 worth at a time. Saw Gumming Wheels are used with the edge (or face) square, round, or beveled. Probably seven-eighths of all in use are beveled.

The principal sizes are:

8x¼ / 8x⅜ / 8x½ } ¾ in. hole. 10x¼ / 10x⅜ / 10x½ / 10x⅝ } ¾ in. hole. 12x¼ / 12x⅜ / 12x½ / 12x⅝ / 12x¾ / 12x⅞ } ¾, ⅞, and 1 in. Holes,

Probably more wheels 12x⅜, 12x½, and 12x¾ are used than all the other sizes together. Saw Gumming Wheels are used, however, of all sizes up to 24x1½. The most frequent complaint is that Emery Wheels harden the saw so that a file won't touch it. The answer is, that you don't want a file to touch it! An expert workman will shape and sharpen the teeth with an Emery Wheel, leaving the teeth *case-hardened,* in which condition it will cut about 33 1-3 per cent. more lumber than a soft saw will. Those who want to use the file, however, have only to touch the saw *lightly* a second time (after going all over it once), and this second touch will cut through the case-hardened scale. The following testimonials, give such practical details that we feel sure they will be convincing:

TESTIMONIALS.

Office of Dodge and Meigs, Tobyhanna Mills, Pa.

T. DUNKIN PARET, PRES'T THE TANITE CO.—*Dear Sir:* Yours, making inquiry about the working of your Tanite Emery Wheels, duly received. We have been using them for about four years, to our entire satisfaction. Have tried Vulcanite and Diston's Wheels, but prefer yours. For the past year we have used them for gumming and sharpening our Gang Saws, and find a decided improvement on the old press gummer. We are running two circular mills, for which we purchase 56 inch Saws, gauge 6 and 7. These saws we grind once in four or five days, requiring from forty minutes to one hour to dress them; shaping the tooth entirely on the Tanite Wheel, using the file only to point the tooth after swedging. Also running one gang of thirty-one 4½ foot Saws, gauge 11, changing twenty-one of them each day, taking about two hours to dress the twenty-one on the wheel. In addition to the above we use two 7 foot Mulays, one 6½ foot Mulay, two 24 inch Edgars, and two 26 cut-off Saws, all of which are dressed on your beveled Wheel 10 inches diameter by ¾ inch thick, Class 2.

Yours respectfully, I. S. CASE, Superintendent.

Factoryville, Pa.

THE TANITE CO.—*Gents:* Your favor of the 18th is received. In reply to the working quality of your Emery Wheel, in my opinion it is a first-class article. I have used all kinds of Saw Gummers, the Lever Gummer, the Grinding Stone Gummer, and the American Saw Co.'s Steel Cutting Gummer, but I find your Emery Wheels as much superior to all of these gummers as the Prussian needle gun is to our old flint-lock musket. With one of your 12 inch wheels, ½ inch thick, I gummed two 30 inch Wood Saws 1¼ inch deep, one Shingle and Lath Saw same depth, and one large Circular Saw 5 feet diameter. This large saw was in very bad shape. In had forty teeth about ¾ of an inch long. I gummed them down 1 inch, making the teeth 1¾, and run off the back of the teeth on the bevel side of the wheel ½ an inch. After this gumming on all these saws, the wear on the wheel was scarce perceptible. The reason why I think this wheel is superior is that you can gum a tooth in any shape you wish, and in half the time you would be with any other gummer. I respectfully recommend this Emery Wheel to all parties running Saws.

Very truly yours, JAMES B. HANNAN.

Anderson, Ind.

THE TANITE CO., STROUDSBURG, PA.—*Gentlemen:* Having used your Emery Wheel for over a year, we take great pleasure in saying they are the best thing now in use for gumming and sharpening Saws. We use them on Heading Saws, Stave Saws, Cut-off Saws, etc. We would not do without them for ten times the price of them. We know of no improvement that could be made on them. They are perfect, and do more than they are recommended to do. Every Wheel we use saves us from $10 to $15 in time and files. For instance, when we break several teeth out of our Saw, we can cut them all off, and cut new teeth in the Saw in less than 8 hours, and at a cost of $2.50; whereas it cost us $10 to $12, before we commenced using The Tanite Emery Wheel. Besides it would take from 3 to 6 days to get it done, as we would have to ship it off, and await its return. We have seen many a time that we would have lost from $50 to $100, had we been without them, in the way of losing time.

Yours very respectfully, C. T. DOXEY & CO.

Alexandra, Va.

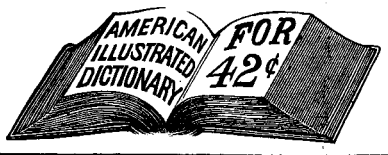
THE TANITE COMPANY.—The wheel I ordered from you is satisfactory. It cuts faster and heats less than any I have used before. You will remember it was a 12-inch wheel, 1-inch thick, and I used it to keep large circular saws in order. Our former practice was to file the teeth so as simply to keep them sharp, and when they became too short send the saws to the manufacturers and have them gummed. When the saw was in constant use, this would occur once in about two months and a half, at an expense of about $15 to $20, including express charges. By the use of an emery wheel this is not required, and much is saved in files. There is also a gain in the amount of work by their use. When the saws are sent to manufacturers we have the teeth made as long and slender as they will bear, to save files and time in filing, and they are not in the most efficient condition till partially worn, and they are also used some time after the teeth are too short to cut easily. By the use of an emery wheel saws may be kept constantly in their most efficient condition. I think their use saves me about $100 per annum, and adds more than that to the amount of work accomplished.

Yours with respect, JOHN HAUXHURST.

* * * * * * * * *

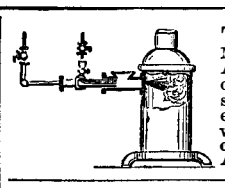
Some users prefer a hard wheel, which will keep its shape; others prefer a soft wheel, which cuts much faster and heats less. Many Emery Wheel makers make only one class. The Tanite Co. *makes both hard and soft wheels,* and can suit all tastes. The Tanite Wheel has long had the reputation of being the very best in the market, but dealers often furnish a poorer wheel because they get a bigger commission or a consigned stock. Tanite Saw Gumming Wheels are all lathe turned, and every wheel is tested at high speeds. A 12 inch wheel, whose working speed is 1,800 revolutions a minute, we test at 5,000 revolutions per minute. If you want what is safe, sure, and reliable, order The Tanite Emery Wheel. We make a large variety of Machines on which to run these wheels. Liberal discount to dealers. Circulars on application.

THE TANITE COMPANY, Stroudsburg, Monroe Co., Pa.



A 700 PAGE DICTIONARY FOR 42 CTS. The American Dictionary of the English Language contains 700 pages, 30,000 words clearly defined, accurately pronounced, and correctly spelled, with nearly 200 illustrations, and is handsomely bound in cloth, with gilt stamp. A library of language in itself. No excuse for word ignorance now. Sent, postpaid, for 42 cents, which is much less than the publisher's price. Two books for 75 cents. Stamps taken.
BURT & PRENTICE, Booksellers, 73 Beekman St., N.Y.

WE MAKE a Good Strong
STEAM ENGINE,
Cylinder 12x15 inches; 35 Horse Power; with Fly Wheel or Pulley and Governor. All complete. New. Price, $600. Address W. P. DUNCAN & CO., Bellefonte, Pa.



THE FORSTER-FIRMIN GOLD AND SILVER AMALGAMATING COMP'Y of Norristown, Pa., will grant state rights or licenses on easy terms. This system works up to assay, and recovers the mercury rapidly. Apply as above.

SAWS
40,000
SAWS
EMERSON'S ILLUSTRATED SAWYERS HAND BOOKS (FREE) TO ANY PART OF THE WORLD.
FULL SIZE PEARCE SAW
3 CENTS EACH
ADDRESS EMERSON, SMITH & CO. BEAVER FALLS, PA.

50 Pin-a-4, Chromo, Lily, Lace, Marble, etc., **Cards,** in case, **10c.** GLOBE CARD CO., Northford, Ct.

A MANUFACTURER WANTED TO make Seixas' Patent Weighted Horse Shoe, as described in this journal Feb. 14th. Address
J. S. BROWN, Galveston, Texas.

BIG Inducements to active agents to sell our goods. Terms and circulars free. Address the manufacturers, GEO. VAN SANDS & CO., Middletown, Conn.

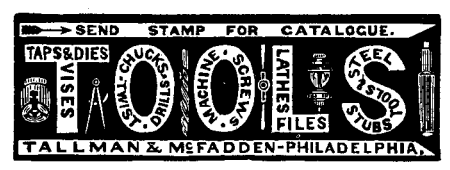
WANTED,

A competent and reliable man as "Time Keeper" in a general machine shop and foundry employing 300 to 400 men. Must be thoroughly experienced. Address
R. W., Box 773, New York.

VALUABLE MACHINERY.

Large Rolling Mill in East St. Louis, Ill., for sale at retail—consisting in part of rail train, muck train, squeezers, punches, slotters, rail straightener, roll lathe and fixtures, engines and boilers. Address early,
POPE IRON & METAL CO., St. Louis, Mo.

SALESMEN WANTED $125 A Month and Expenses selling to DEALERS SAMPLES FREE. Send 3c. STAMP to insure answer. S. FOSTER & CO., Cincinnati, O. **CIGARS**



ACME STEAM PUMPS,

FOR EVERY DUTY.

VALLEY MACHINE CO.,

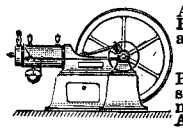
EASTHAMPTON, MASS.

CORRUGATED AND CRIMPED IRON **ROOFING AND SIDING,** Iron Buildings, Roofs, Shutters, Doors, Cornices, Skylights, Bridges, etc. MOSELEY IRON BRIDGE AND ROOF CO., 5 Dey Street, New York.

HARDWOOD LUMBER
AND
VENEERS.

Mahogany, Rosewood, Satinwood, French and American Walnut, Burl Veneers, Hungarian Ash, Amaranth, etc., etc. Manufacturers will find our stock unusually choice and prices low. Full line of Rare and Fancy Woods planed for Amateur's use.

GEO. W. READ & CO.,
186 to 200 Lewis St., New York.

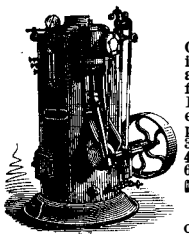


An engine that works without Boiler. Always ready to be started and to give at once full power.
SAFETY, ECONOMY, CONVENIENCE
Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.

THE NEW OTTO SILENT GAS ENGINE.

Useful for all work of small stationary steam engine. Built in sizes of **2, 4,** and **7** H. P. by **SCHLEICHER, SCHUMM & CO.,** 3045 Chestnut Street, Phila., Pa. **H. S. Manning & Co.,** 111 Liberty St., N. Y., Agents.

50 Chromo, Glass, Scroll Wreath, and Lace **Cards, 10c.** Try us. CHROMO CARD CO., Northford, Ct.



Bookwalter Engine.

Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

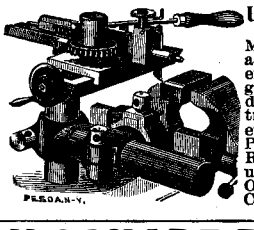
3 HORSE POWER	$240 00
4½ " "	280 00
6½ " "	370 00

☞ Put on cars at Springfield, O.
JAMES LEFFEL & CO., Springfield, Ohio.
or 110 Liberty St., New York.

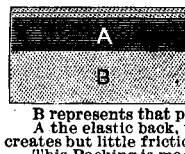
50 Perfumed Cards, best assortment ever offered, **10c.** Agts. Outfit, **10c.** CONN. CARD CO., Northford, Ct.

Plans and Specifications for a Rice Cleaning Mill,

WITH a capacity of 100 casks per day, and for a storehouse for rough rice with a capacity of 150,000 bushels, to be built in the city of Savannah, Ga., are invited for thirty days. Right reserved to reject any or all bids. For particulars, apply W. P. CARMICHAEL, HENRY TAYLOR, L. W. HASKELL, J. A. HUGER, Savannah, Ga., Committee.



Universal Hand Planer, Judson's Patent.
Model makers, jewelers, and metal workers generally, find this tool of great value. Prices reduced. Send for illustrated catalogue of Planers, Iron Cutters, Shears, Punches. Universal Ratchet Drills, etc. Manufactured exclusively by OLD COLONY RIVET CO., Kingston, Mass.



RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.

A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.

This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

JOHN H. CHEEVER, Treas. NEW YORK BELTING & PACKING CO., 37 & 38 Park Row, New York.

All Strong Plants, each labeled, delivered safely by mail. **Largest assortment. Low prices.** In business for **26 years.** *Guarantee satisfaction.* Stock comprises *all desirable varieties.* Only mature plants sent. Our new **Illustrated Hand-Book,** sent free, contains the name and description of each plant, with instructions for **successful** cultivation. *Do not purchase plants* **elsewhere** *before sending for our new* **HAND-BOOK** Every lover of *flowers* should have it. All buyers of *cheap plants* should have it. Every one wanting *new* and *choice plants* should send for our *Hand-Book.*
HOOPES, BROTHER & THOMAS,
CHERRY HILL NURSERIES, West Chester, Pa.

BARNES' PATENT FOOT POWER MACHINERY.

CIRCULAR SAWS, SCROLL SAWS, LATHES, FORMERS, MORTISERS, TENONERS, &c., for actual workshop business.

COMPLETE OUTFITS for Mechanics and Amateurs.

MACHINES ON **TRIAL** IF DESIRED.

Say where you read this, and send for Descriptive Catalogue and Price List. W. F. & JOHN BARNES,
Rockford, Ill.

50 Chromo, Tortoise Shell, Cupid, Motto, Floral Cards, **10c.** Outfit, **10c.** HALL BROS., Northford, Ct.

PHOSPHOR-BRONZE,

ACKNOWLEDGED to be the BEST METAL for

BEARINGS, HYDRAULIC CYLINDERS, Pump Rods, Cog Wheels, SLIDES, VALVES, BOLTS, ETC.

TRADE MARKS.

Phosphor-Bronze.

Pamphlets and particulars on application to

The Phosphor-Bronze Smelting Co., Limited,
2038 Washington Ave., Phila., Pa.

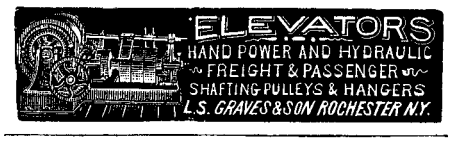
Sole Manufacturers of Phosphor-Bronze in the U. S.

SPY GLASSES, FIELD GLASSES MICROSCOPES,

JAMES W. QUEEN & CO.,
924 CHESTNUT ST., PHILADELPHIA, PA.

Catalogues sent on application.

Part 1.—Mathematical Instructions.
Part 2.—Optical Instruments.
Part 3.—Magic Lanterns.
Part 4.—Philosophical Apparatus.



Ammoniacal Liquor and Coal Tar.

Sealed Proposals will be received at the office of the Cincinnati Gas Light and Coke Company, Cincinnati, Ohio, until 12 o'clock noon, May 1st, 1880, for the Ammoniacal Liquor produced at the works of said Company, extending over a period of five (5) years from July 1, 1880.

The Liquor will be delivered in car-tanks on side track, in tank-barges on the river, or at any point on the line of the Gas Company's premises. The strength to be of the same average as at present.

Bids will be received at so much per ton, of 2 000 pounds, of coal carbonized. Payments to be made monthly.

Security in the sum of $10,000 will be required.

The Company reserves the right to reject any and all bids.

If desired by the successful bidder, arrangements can be made for the purchase of the Coal Tar produced during the same period. Address
ROBERT BROWN, JR., Sec'y,
Cincinnati Gas Light and Coke Co.,
Cincinnati, O.

© 1880 SCIENTIFIC AMERICAN, INC

The Literary Revolution—History.

The Literary Revolution is emphatically in the interest of good literature and of sensible people. The trash, or pestilential stuff that makes up the cheap "*Libraries*" that flood the country, is utterly discarded. History, Biography, Poetry, Science—the best productions of the ablest writers the world has known, make up the volumes issued from our presses.

"What is worth reading is worth preserving," is one motto of the "Revolution." Notwithstanding the incomparably low prices, the best and handiest forms of volumes for reading and reference have been adopted, and the binding is always neat, strong and durable. The books are made for people who value contents rather than covers, and who want a limited sum of money to do them the greatest possible service.

Acme Library of History.

In this series it is proposed to present the works of the great authors whose writings have themselves become a part of history, and are associated in the minds of all readers with the nations whose history they narrate. We shall publish them at prices which, compared with usual rates, will be considered marvelously low.

The type in the *Acme* and in the *Aldus Editions* is the same. The paper in the *Acme Edition* is light, but excellent in quality, and all that is generally desired. All of our binding is extra well done. The cloth binding is very neat, and will serve for many years of good usage. The half Russia is more elegant, as well as more durable, and to any one who can spare the small additional cost it is the much more desirable style. The *Aldus Edition* is printed with extra care, on heavy paper, with much wider margins. In this form our books will compare favorably, if they do not contrast favorably, with the best editions of the same works which have ever been published.

A Great Offer. As the best possible advertisement for our historical series will be to scatter the volumes among purchasers throughout the country, and thus demonstrate their unrivaled excellence combined with low price, we offer to the **first 10,000 purchasers** of Gibbon and Macaulay a **special discount of 10 per cent.** from the list prices given. *Readers of this paper who will cut out and return this slip, with their remittance, within* 10 *days* of receipt of this paper, will be sure of admittance at the first 10,000 rate. **For 10 Days.**

Macaulay's History of England.

History of England. By Thomas Babington Macaulay. In three volumes of about 2,300 pages, beautiful new large-faced brevier type, with very full index. Volume III., completing the work, ready March 31st.

Acme Edition, extra cloth, gilt title	$1 50
Acme Edition, half Russia, sprinkled edges	2 25
Aldus Edition, half Russia, gilt top	3 00

Postage: Acme Edition, 24 cents; Aldus Edition, 36 cents.

For reading or reference we believe this to be the best edition of Macaulay ever issued. Readers will certainly prefer it to the five-volume edition which until recently was sold by the millionaire publishing houses at $7.50 for the cloth, but lately reduced considerably by competition with us.

"The most popular historical work that ever issued from the English press. . . . As widely as our language has traveled these volumes have spread the reputation and the opinions of the author."—*Edinburgh Review.*

"Mr. Macaulay can afford to smile at all reviewers who affect to possess more than his own gigantic stores of information."—*Sir Archibald Alison.*

"Every page bears testimony to a degree of conscientious and minute research which no historian has ever surpassed."—*North British Review.*

"The style is faultlessly luminous; every word is in its right place; every sentence is exquisitely balanced; the current never flags."—*Westminster Review.*

"Macaulay is like a book in breeches."—*Sydney Smith.*

Milman's Gibbon's Rome.

History of the Decline and Fall of the Roman Empire. By Edward Gibbon. With Notes by H. H. Milman. A new edition, in five volumes, with very full Index. The type is new, very clear, large-faced bourgeois. Volume V., completing the work, ready March 25th.

Acme Edition, extra cloth, gilt title	$2 50
Acme Edition, half Russia, sprinkled edges	3 75
Aldus Edition, half Russia, gilt top	5 00

Postage: Acme Edition, 40 cents; Aldus Edition, 60 cents.

No other edition of Gibbon's Rome ever published in this country at less than four times its price will compare with this in beauty of typography, convenience of form and excellence of binding.

"He exhibits his ideas in the most splendid and imposing forms of which the English language is capable."—*Prescott.*

"As edited by Milman, a work for all time and all classes."—*London Monthly Review.*

"Gibbon, the architect of a bridge over the dark gulf which separates ancient from modern times, whose vivid genius has tinged with brilliant colors the greatest historical work in existence."—*Alison.*

"His work . . . is often something more than history, and above it; it is philosophy, it is theology, it is wit and eloquence, it is criticism the most masterly on every subject with which literature can be connected."—*Prof. Smyth.*

"His book, in spite of its faults, will always be a noble work."—*Guizot.*

"His eloquence and his great skill in representation give a charm and splendor to the thoughts which he wishes to disseminate."—*Schlosser* (translated by Davidson).

Knight's History of England.

Popular History of England, by Charles Knight. Complete in 4 vols. 12mo. Nearly 5,000 pages, beautiful new bourgeois type, with illustrations. Neatly and strongly bound in extra cloth, **$3.00;** in elegant and durable half Russia, gilt top, **$5.00.** Postage, 48 cents. Just ready.

This greatest work of one of the most justly celebrated authors of modern times covers the entire period of English history from earliest times to the present, in this respect differing from the works of Hume, Macaulay, Froude and others, each of which covers but a short period of time. Until recently it has not been published in this country at a less price than $25.00; in 1879 an edition printed in the same type as the one now issued by us, but without illustrations, was published at $10.00. As issued by us, KNIGHT'S ENGLAND, in type, paper, illustrations, printing and binding, is all that can be desired by the general reader.

"The best history of England for the general reader. For a single history which may serve for constant use and reference in the library, or for frequent reading, it is to be preferred to every other."—*Noah Porter.*

"We very cordially recommend these volumes. We know of no history of England so free from prejudice, so thoroughly honest and impartial, so stored with facts."—*London Athenæum.*

"Its literary merits are of a very high order; indeed, nothing has ever appeared superior, if anything has been published equal, to the account of the state of commerce, government and society at different periods."—*Lord Brougham.*

"Mr. Knight's book well deserves its name; it will be emphatically popular, and it will gain its popularity by genuine merit. It is as good a book of the kind as ever was written."—*Westminster Review.*

"The last and greatest literary work of his life. This history will remain, for many a long day, a standard work."—*London Times.*

"This work is the very best history of England that we possess."—*London Standard.*

Rollin's Ancient History.

Ancient History of the Egyptians, Carthagenians, Assyrians, Babylonions, Medes and Persians, Grecians and Macedonians, including a history of the arts and sciences of the ancients, by Charles Rollin. In one very large octavo volume, 1,318 double-column pages, very large clear type. Price, strongly bound in cloth, **$2.25;** in half Russia, sprinkled edges, **$2.75;** postage 42 cents.

For more than a hundred years ROLLIN'S ANCIENT HISTORY has ranked with the best of great historical works. The author has been especially noted for the intense interest with which he clothes his subject, so that his history has found its way into the home of the unlearned, as well as into the library of the scholar. The edition being issued by us is not only the best edition which is now offered to the public at any price, but is cheap, quite beyond comparison with the cheapest and most inferior editions.

Comic History of the United States.

By L. Hopkins. Copiously Illustrated by the Author, from Sketches taken at a Safe Distance. 16mo, Cloth extra, Ebony and Gold. Price, **50 cents;** Postage, 7 cents.

"When it first became noised abroad that he contemplated bringing out an Illustrated History of the United States, he was deluged with letters from a host of well-disposed persons, such as Thomas Carlyle, James Parton, Wendell Phillips, and others of more or less literary ability, offering to "write up" to his pictures. Mr. Carlyle said he could do it nights. But the public was not to be trifled with, so he resolved to put his shoulder to the literary as well as the artistic wheel, as it were, and he flatters himself he has demonstrated in these pages that truth is more of a stranger than fiction."—*From Author's Preface.*

Verdict of Press and People.

"It is a marvel in book-making."—*Telegraph*, Pittsburgh.

"We country parsons can now fill our shelves."—*Rev. C. H. A. Bulkley*, Port Henry, N. Y.

"The American Book Exchange is solving the important problem."—*Evening Journal*, Chicago.

"We unhesitatingly indorse the American Book Exchange, and commend its course in bringing the best literature within reach of all classes."—*Central Baptist*, St. Louis.

"I regard Mr. Alden as a benefactor, and shall endeavor to disseminate a knowledge of him and his wares among my acquaintances."—*C. H. Bordman*, St. Paul, Minn.

"Has some rich relative left you a colossal fortune which you are spending in publishing books for the people at nominal prices? If so, I admire your taste. But won't the old-line publishers be glad when it is gone?"—*B. F. Congdon*, Randolph, N. Y.

"Your lives will be intolerable without this work. Send and get it: we can't lend ours."—*State Journal*, Jefferson City, Mo.

"The American Book Exchange deserves credit for the part it is taking in popularizing standard literature."—*Christian Union*, New York."

"The cheapest publication ever given to the public."—*Courier*, Syracuse.

"A marvel of cheapness and excellence."—*Bookseller*, Chicago.

"Deserves hearty praise for neatness and attractiveness."—*Press*, Newark, N. J.

"The American Book Exchange is doing a very remarkable work."—*Journal*, Boston.

"Among the marvels in cheap reprints."—*Herald*, New York.

"The publishers are doing an invaluable service to the public."—*Chronicle*, Montpelier.

"Well selected and beautifully printed."—*Republican*, Springfield, Mass.

"The catalogue is a most astonishing exhibit of good things at low prices. An opportunity never before presented."—*Sunday Press*, Philadelphia.

"We were surprised into incredulity by the announcement. . . We have procured the volume, and find it even so."—*Religious Herald*, Richmond, Va.

"It is wonderful how such a useful and valuable work can be sold for so low a price."—*Presbyterian*, Baltimore.

"The Library of Universal Knowledge is as comprehensive as Appleton's splendid work, at just one tenth the price"—*Sentinel*, Lewiston, Pa.

"A marvel of good binding and printing."—*Daily Graphic*, N. Y.

"An acquisition to the library of the real lover of books, who values contents rather than covers. It is scarcely an exaggeration to say the prices average one-tenth of the standards from which they are reprinted."—*Pioneer Press*, St. Paul.

"Marvelously cheap."—*Courant*, Hartford, Conn.

"It is a rare book for the price."—*Christian Secretary*, Hartford.

"Remarkably cheap . . . exceedingly convenient and tasteful"—*Christian Intelligencer*, N. Y.

"A marvel in the book-making line."—*Presbyterian Banner*, Pittsburgh.

Other Standard Books.

Library of Universal Knowledge, 20 vols., $10.
Chambers's Cyclopedia of Eng. Literature, 4 vols., $2.
Plutarch's Lives of Illustrious Men, 3 vols., $1.50.
Geikie's Life and Words of Christ, 50 cents.
Young's Bible Concordance, 311,000 references (preparing), $2.50.
Acme Library of Biography, 50 cents.
Book of Fables. Æsop, etc., illus., 50 cents.
Milton's Complete Poetical Works, 50 cents.
Shakespeare's Complete Works, 75 cents.
Works of Dante, translated by Cary, 50 cents.
Works of Virgil, translated by Dryden, 40 cents.
The Koran of Mohammed, translated by Sale, 35 cts.
Adventures of Don Quixote, illus., 50 cents.
Arabian Nights, illus., 50 cents.
Bunyan's Pilgrim's Progress, illus., 50 cents.
Robinson Crusoe, illus., 50 cents.
Munchausen and Gulliver's Travels, illus., 50 cents.
Stories and Ballads, by E. T Alden, illus., $1.
Acme Library of Modern Classics, 50 cents.
American Patriotism, 50 cents.
Taine's History of English Literature, 75 cents.
Cecil's Book of Natural History, $1.
Pictorial Handy Lexicon, 35 cents.
Sayings, by author of Sparrowgrass Papers, 50 cents.
Mrs. Hemans's Poetical Works, 75 cents.
Kitto's Cyclopedia of Bib. Literature, 2 vols., $2.
Smith's Dictionary of the Bible, illus., $1.
Works of Flavius Josephus, $2.
Health by Exercise, Dr. Geo. H. Taylor, 50 cents.
Health for Women, Dr. Geo. H. Taylor, 50 cents.
Library Magazine, 10 cents a number, $1 a year.
Library Magazine, bound volumes, 60 cents.
Leaves from the Diary of an old lawyer, $1,

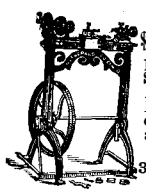
Each of the above bound in cloth. If by mail, postage extra. Most of the books are also published in fine editions and fine bindings, at higher prices.

Descriptive Catalogues and Terms to Clubs sent free on request.

Remit by bank draft, money order, registered letter, or by express. Fractions of one dollar may be sent in postage stamps. Address

AMERICAN BOOK EXCHANGE,

JOHN B. ALDEN, *Manager.* **Tribune Building, New York.**



SHEPARD'S CELEBRATED $50 Screw Cutting Foot Lathe.

Foot and Power Lathes, Drill Presses, Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Send for catalogue of outfits for amateurs or artisans.

H. L. SHEPARD & CO.,
331, 333, 335. & 337 West Front Street,
Cincinnati, Ohio.

THE DRIVEN WELL.

Town and County privileges for making **Driven Wells** and selling Licenses under the established **American Driven Well Patent,** leased by the year to responsible parties, by

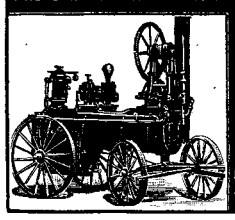
WM. D. ANDREWS & BRO.,
235 BROADWAY, NEW YORK.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.

DAVID W. POND, Worcester, Mass.

PROSPECTING MINERAL LANDS A SPECIALITY.
CYLINDRICAL SECTIONS OR CORES OBTAINED THE WHOLE DISTANCE BORED. ARTESIAN WELLS BORED ROUND AND STRAIGHT ADMITTING A LARGER PUMP AND CASING IN PROPORTION TO SIZE OF HOLE THAN BY ANY OTHER PROCESS. ESTIMATES GIVEN AND CONTRACTS MADE BY



THE PENNSYLVANIA DIAMOND DRILL CO.
BOX 423 POTTSVILLE PA.
MANFTRS. OF DIAMOND DRILLS FOR ALL KINDS OF ROCK BORING.

SPARE THE CROTON AND SAVE THE COST.

Driven or Tube Wells

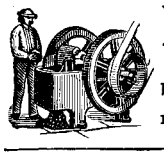
furnished to large consumers of Croton and Ridgewood Water. WM. D. ANDREWS & BRO., 235 Broadway, N.Y., who control the patent for Green's American Driven Well.

WANTED.

Master Mechanic for Steel Rolling Mill. Must be a first-class Engineer and Roll Turner, and competent to superintend all Mill Machinery, steady and industrious, with good recommendations. Position permanent, with good pay. Address "MANAGER," Box 773, New York.

The George Place Machinery Agency

Machinery of Every Description.
121 Chambers and 103 Reade Streets, New York.



ROCK BREAKERS & ORE CRUSHERS.

(THE "BLAKE" STYLE.)

This machine has for twenty years stood the TEST, and found to be the *best one* made for breaking all kinds of hard and brittle substances, such as ORES, QUARTZ, EMERY, etc., etc.

Mr. S. L. Marsden, for the past twenty years connected with the manufacture of this machine, superintends its manufacture.

FARREL FOUNDRY AND MACHINE CO., Manufrs., Ansonia, Conn.

THE

MOSS ENGRAVING CO.,

(MOSS'S NEW PROCESS,)

535 PEARL STREET, COR. ELM,

ONE BLOCK FROM BROADWAY,

JOHN C. MOSS, Supt. **NEW YORK.**

MR. JOHN C. MOSS, having disposed of all his interest in the PHOTO-ENGRAVING CO., 67 Park Place, has arranged with this Company to superintend its operations, which will be conducted on an extensive scale under the improved process recently invented by him, which is greatly superior to the old. The lines are much deeper, and the cost of production much less.

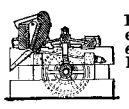
OUR MOTTO IS

"THE BEST WORK AT LOW PRICES, ALWAYS ON TIME."

Parties having engraving to do, will find it to their interest to give our NEW METHOD a trial.

"BLAKE'S CHALLENCE" ROCK BREAKER.

Patented November 18, 1879.



For **Macadam Road** making, Ballasting of **Railroads,** Crushing **Ores,** use of **Iron Furnaces,** etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency,* and *simplicity.* Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medal of *Superiority* awarded by American Institute.

BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

THE SKINNER PORTABLE & STATIONARY ENGINES
BOILERS & GOVERNORS
FIRST CLASS & ECONOMICAL. SKINNER & WOOD. ERIE. PA.
SEE ILLUSTRATED ADVERTISEMENT

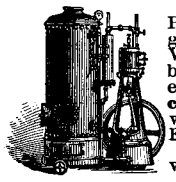
Wood-Working Machinery,

Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, Eastman's Pat. Miter Machines, and Wood-Working Machinery generally. Manufactured by

WITHERBY, RUGG & RICHARDSON,
26 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)

B. W. PAYNE & SONS, CORNING, N. Y.

ESTABLISHED 1840.



Patent Spark-Arresting Engines, mounted and on skids. Vertical Engines with wrought boilers. Eureka Safety powers with Sectional boilers—**can't be exploded.** All with Automatic Cut-Offs. From **$150 to $2,000.** Send for Circular. State where you saw this.

JOHN R. WHITLEY & CO.

European Representatives of American Houses, with First-class Agents in the principal industrial and agricultural centers and cities in Europe. London, 7 Poultry, E. C. Paris, 8 Place Vendôme. Terms on application. J. R. W. & Co. purchase Paris goods on commission at shippers' discounts.

WOOD WORKING MACHINERY.

PLANING, MATCHING, MOLDING, MORTISING, TENONING, CARVING, MACHINES. BAND & SCROLL SAWS UNIVERSAL AND VARIETY WOOD WORKERS, &c. &c.

J. A. FAY & CO.
CINCINNATI, O. U. S. A.

CATARRH Successfully Treated and Permanently **CURED** in every case. **No Pay Till Cured.** DR. J. K. ROSS, CENTREVILLE, IND.

Elegant Autograph Album, gilt covers, 48 pages, illustrated with birds, scrolls, etc., in colors and 47 Select Quotations, **15c.** Agents' Outfit for Cards (over 60 samples), **10c.** DAVIDS & Co., Northford, Ct.

© 1880 SCIENTIFIC AMERICAN, INC

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

METALS.

Important Books on Metals, Metal Mining, Metal Working, Assaying, Analysis, etc.

Bauerman.—A Treatise on the Metallurgy of Iron. Containing Outlines of the History of Iron, Manufacture, Methods of Assay and Analysis of Iron Ores, Processes of Manufacture of Iron and Steel. Illus. 12mo, $2.00

Blinn.—Practical Workshop Companion for Tin, Sheet Iron, and Copper Plate Workers. 100 illus. 12mo, $2.50

Byrne.—The Practical Metal Worker's Assistant. Comprising Metallurgic Chemistry; the Arts of Working all Metals and Alloys; Forging of Iron and Steel; Hardening and Tempering; Melting and Mixing; Casting and Founding; Works in Sheet Metal; the Processes Dependent on the Ductility of the Metals; Soldering; and the most improved Processes and Tools employed by Metal Workers. With the application of the Art of Electro-Metallurgy to Manufacturing Processes. By Oliver Byrne. To which is added an Appendix, containing the Manufacture of Russian Sheet Iron. By John Percy. The Manufacture of Malleable Iron Castings and Improvements in Bessemer Steel. By A. A. Fesquet. With over 600 engravings, $7.00

Davies.—A Treatise on Metalliferous Minerals and Mining. By D. C. Davies, F.G.S., Mining Engineer, Examiner of Mines, Quarries, and Collieries. In one volume, 12mo, 450 pp. Illustrated by 148 engravings of Geolo ical Formations, Mining Operations and Machinery, drawn from the practice of all parts of the world, $5.00

DeKoninck.—Dietz.—A Practical Manual of Chemical Analysis and Assaying: As Applied to the Manufacture of Iron from its Ores, and to Cast Iron, Wrought Iron, and Steel, as found in Commerce. By DeKoninck, Dietz, and Mallet. American Edition, with Notes and an Appendix on Iron Ores, by A. A. Fesquet. 12mo, $2.50

Gee.—The Practical Gold Worker. The Art of Alloying, Melting, Refining, Reducing, Coloring, Collecting and Refining; the Processes of Manipulation, Recovery of Waste, Chemical and Physical Properties of Gold, Mixing of Alloys, Solders, Enamel, etc., etc. 12mo. $3.50

Gee.—The Silversmith's Hand Book. Instructions for Alloying and Working Silver; Refining, Melting, Solders, Alloys, Imitations, etc. Illustrated. 12mo, $3.50

Guettier—Fesquet.—A Practical Guide for the Manufacture of Metallic Alloys. Comprising their Chemical and Physical Properties, with their Preparation, Composition, and Uses. From the French of A. Guettier, by A. A. Fesquet. 12mo, $3.00

Gruner.—Study of Blast Furnace Phenomena. By M. L. Gruner, Prof. of Metallurgy, Ecole des Mines. 8vo, $2.50

Kirk.—The Founding of Metals. Illustrated. 8vo, $2.50

Kobell.—Erni.—Mineralogy Simplified: A short method of Determining and Classifying Minerals, by means of simple Chemical Experiments in the Wet Way. From the German of F. Von Kobell, with an Introduction to Blowpipe Analysis, and other additions. By Henri Erni, M.D. 12mo, $2.50

Landrin.—A Treatise on Steel. Comprising its Theory, Metallurgy, Properties, Practical Working, and Use. From the French, by A. A. Fesquet. 12mo, $3.00

Larkin.—The Practical Brass and Iron Founder's Guide. A Concise Treatise on Brass Founding, Moulding, the Improvements in the Manufacture of Iron and Steel by the Bessemer Process, etc., etc. By James Larkin. 12mo, $2.25

Lieber.—Assayer's Guide; Or, Practical Directions to Assayers, Miners, and Smelters, for the Tests and Assays, by Heat and by Wet Processes, for the Ores of all the Principal Metals, of Gold and Silver Coins and Alloys, and of Coal, etc. 12mo, $1.25

Napier.—Manual of Electro Metallurgy, Including its Application to Manufacturing Processes. Illustrated. 8vo, $2.00

Normandy.—The Commercial Handbook of Chemical Analysis; or, Practical Instructions for the Determination of the Intrinsic or Commercial Value of Substances used in Manufactures, in Trades, and the Arts. Edited by H. M. Noad. 12mo, $5.00

North.—The Practical Assayer, containing Easy Methods for the Assay of the Principal Metals and Alloys. Designed for Explorers and those interested in Mines. By Oliver North. 12mo, $2.50

Orton.—Underground Treasures: How and Where to Find Them. A Key for the Ready Determination of all the Useful Minerals within the United States. By James Orton, A.M. Illustrated, 12mo, $1 50

Overman.—The Manufacture of Steel. By A. A. Fesquet. 12mo, $1.50

Osborn—Metallurgy of Iron and Steel, theoretical and practical, in all its branches, with special reference to American materials and processes. Illustrated by numerous large folding plates and wood engravings. 8vo, $15.00

Perkins and Stowe.—New Guide to the Sheet Iron and Boiler Plate Roller. $2.50

Phillips and Darlington.—Records of Mining and Metallurgy. Illustrated. 12mo, $2.00

Percy.—Manufacture of Russian Sheet Iron. 8vo, Paper, $0.50

Roseleur.—Galvano-plastic Manipulations. A practical guide for the Gold and Silver Electro-plater and the Galvano-plastic Operator. 127 engravings. 495 pages, 8vo, $6.00

Tables Showing the Weight of Round, Square, and Flat Bar Iron, Steel, etc., by measurement, $0.63

Urbin and Brull.—Practical Guide for Puddling Iron and Steel. 8vo, $1.00

Vail.—Galvanized Iron Cornice Workers' Manual. Containing instructions in laying out the different Miters and making patterns for all kinds of plain and circular work. Illustrated. 4to, 5.00

Warn.—The Sheet-Metal Worker's Instructor. For Zinc, Sheet-Iron, Copper, and Tin-Plate Workers. To which is added an Appendix, containing instructions for Boiler Making, Measurement of Surfaces and Solids, Rules for Calculating the Weights of different figures of Iron and Steel, Tables for the Weights of Iron, Steel, etc. Illustrated by 32 plates and 37 wood engravings. 8vo. $3.00

Will.—Tables of Qualitative Chemical Analysis. With an Introductory Chapter on the Course of Analysis. By H. Will. Edited by C. F. Himes. 8vo, $1 50

Wöhler.—A Hand-Book of Mineral Analysis. By F. Wöhler. Edited by Henry B. Nason. Illustrated. 12mo, $3 00

☞ The above or any of our books sent by mail, free of postage, at the publication prices.

Ournewand enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 96 pages, 8vo; a Catalogue of Books on DYEING, CALICO PRINTING, WEAVING, COTTON and WOOLEN MANUFACTURE, 4to; Catalogue of a choice collection of PRACTICAL, SCIENTIFIC, and ECONOMIC BOOKS, 4to; List of Books on STEAM AND THE STEAM ENGINE, MECHANICS, MACHINERY, and ENGINEERING, 4to. List of Important Books on METALLURGY, METALS, STRENGTH OF MATERIALS, CHEMICAL ANALYSIS, ASSAYING, etc., 4to; List of Books on MINING, MINING MACHINERY, COAL, etc., 4to; two Catalogues of Books and Pamphlets on SOCIAL SCIENCE, POLITICAL ECONOMY, BANKS, POPULATION, PAUPERISM, and kindred subjects; a Catalogue of recent additions to our stock of PRACTICAL SCIENTIFIC AND TECHNICAL BOOKS; as well as a List of LEADING BOOKS on METAL MINING, METALLURGY, MINERALOGY, ASSAYING, AND CHEMICAL ANALYSIS, sent free to any one who will forward his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA.

ROCK DRILLING MACHINES AND AIR COMPRESSORS.
MANUFACTURED BY BURLEIGH ROCK DRILL CO.
SEND FOR PAMPHLET. FITCHBURG MASS.

Lathes, Planers, Shapers
Drills, Bolt and Gear Cutters, Milling Machines. Special Machinery. E. GOULD & EBERHARDT, Newark, N. J.

PORTLAND CEMENT,
From the best London Manufacturers.
K. B. & S. AND BURHAM CEMENTS.
For sale by JAMES BRAND, 85 Beekman St., New York.

SEE SPECIAL TANITE ADVERTISEMENT ON INSIDE PAGE.

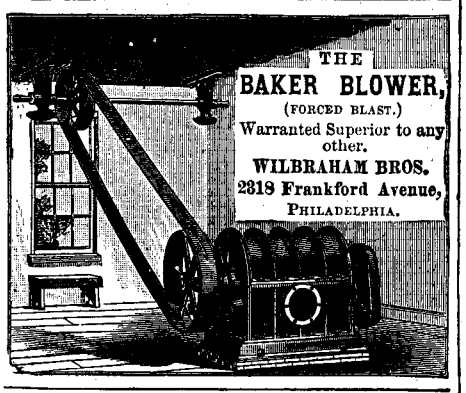
THE HOLLY SYSTEM OF STEAM HEATING CO. FOR CITIES AND VILLAGES. HOLLY STEAM COMBINATION CO. LIMITED. LOCKPORT N.Y. SEE ILLUSTRATED AD IN LAST NUMBER.

The New York Ice Machine Company,
21 COURTLANDT STREET. ROOM 54.
Low Pressure Binary Absorption System.
Advantages over other Machines.
Makes 25 per cent. more Ice. Uses only ¼ water of condensation. No Pressure at rest. Pressure in running, 14 pounds. Self-lubricating. No Leaks, non-inflammable. No action on Metals. Easy Attendance.

IMPLEMENTS, MACHINERY, ETC.
Catalogues, prices, and Agency terms solicited. Unexceptional references. OSKAR NETZLER, Agent in Brisbane, Queensland, Australia.

COLUMBIA BICYCLE.
A practical road machine. Indorsed by the medical profession as the most healthful of outdoor sports. Send 3 cent stamp for 24 page catalogue, with price list and full information, or 10 cents for catalogue and copy of *The Bicycling World.*
THE POPE M'F'G CO.,
89 Summer Street, Boston, Mass.

MACHINISTS' TOOLS.
NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

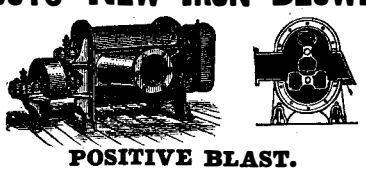


THE BAKER BLOWER,
(FORCED BLAST.)
Warranted Superior to any other.
WILBRAHAM BROS.
2319 Frankford Avenue,
PHILADELPHIA.

DROP HAMMERS.
STILES & PARKER PRESS CO., Middletown, Conn.

Working Models
And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 62 Centre St., N. Y.

ROOTS' NEW IRON BLOWER.

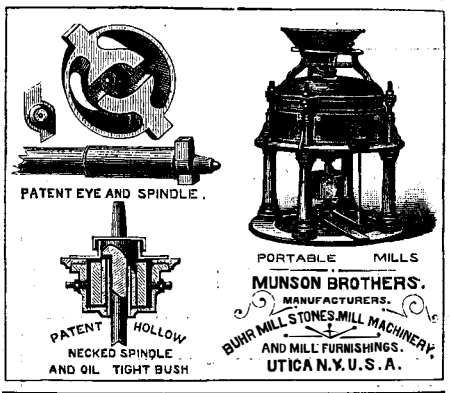


POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED
IS SIMPLER, AND HAS
FEWER PARTS THAN ANY OTHER BLOWER.
P. H. & F. M. ROOTS, Manuf'rs,
CONNERSVILLE, IND.

S. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., 8 Dey Street,
WM. COOKE, Selling Agt., 6 Cortlandt Street,
JAS. BEGGS & CO., Selling Agts., 8 Dey Street,
} NEW YORK.
☞ SEND FOR PRICED CATALOGUE.

WIRE ROPE
Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

A New Spinning Band.
ROWBOTTOM'S PATENT DOUBLE LOOPED SPINNING BAND. Suitable for all kinds of Spinning and Doubling Frames for Woolen, Worsted, Cotton, Flax, or other fibrous substances. **IS FREE FROM KNOTS,** neat, speedily adjusted, runs steadily, and avoids the annoyance of Lint. Price, fifty cents per pound, delivered at the mill. Sample orders solicited. State kind of machinery, diameter of Driving Cylinder, and actual length required when in operation.
STODDARD, LOVERING & CO., Sole Agents,
No. 10 Milk Street, Boston, Mass.


PATENT EYE AND SPINDLE.
PATENT HOLLOW NECKED SPINDLE AND OIL TIGHT BUSH
PORTABLE MILLS
MUNSON BROTHERS.
MANUFACTURERS.
BUHR MILL STONES. MILL MACHINERY AND MILL FURNISHINGS.
UTICA N.Y. U.S.A.

52 Gold, Crystal, Lace, Perfumed, and Chromo Cards, name in Gold & Jet 10c. Clinton Bros. Clintonville, Ct.

NEW FLORAL AUTOGRAPH ALBUM.
Illustrated with Birds, Scrolls, Ferns, Flowers, etc. (48 Pages). Covers and edges elegantly Gilded; also 47 select quotations, all for 15c.; including Outfit, 75 styles Photograph and Visiting Cards, 25c., post-paid (stamps taken). Agents wanted. G. W. BOCEMSDES, West Haven, Conn.

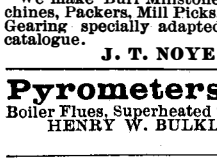
WOOD SOLE SHOES.
The cheapest, most durable, warm, good looking, and thoroughly waterproof shoe. Particularly adapted to Brewers, Miners, and all classes of laborers. Send stamp for circular and price list.
CHAS. W. COPELAND,
122 Summer St., Boston, Mass.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

RAILROAD DEPOTS IRON BUILDINGS WHARF SHEDS
SUGAR HOUSES SELF FITTING COTTON STORES
PUBLIC MARKETS (CATALOGUES GRATIS) RETORT HOUSES
WALTER C. BERGIUS & CO - GLASGOW - SCOTLAND.

BOILER COVERINGS.
Plastic Cement and Hair Felt, with or without the Patent **"AIR SPACE"** Method.
ASBESTOS MATERIALS,
Made from pure Italian Asbestos, in fiber, mill board, and round packing. **THE CHALMERS-SPENCE CO.,** 40 John Street, and Foot of E. 9th Street, New York.

ORGAN BEATTY PIANO
New Organs 13 Stops, 3 set Golden Tongue Reeds, 5 Oct's, 2 Knee Swells, Walnut Case, warn't'd 6 years, Stool & Book $98. New Pianos, $143 to $255. ☞ Newspapers sent Free. Address Daniel F. Beatty, Washington, New Jersey.



"BUCKEYE" LAWN MOWER.
The lightest and easiest running MOWER ever made.
STRICTLY FIRST CLASS.
MAST, FOOS & CO.,
Springfield, Ohio.
Send for catalogue.

Mill Stones and Corn Mills.
We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

Pyrometers, For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, N. Y.

WATSONS NON CHANGEABLE GAP LATHE HAS GREAT FACILITIES FOR LARGE OR MEDIUM SIZE WORK. JAMES WATSON MANR 1608 S. FRONT ST. PHILA. PA.

The Asbestos Packing Co.,
Miners and Manufacturers of Asbestos,
BOSTON, MASS.,
OFFER FOR SALE:
PATENTED ASBESTOS ROPE PACKING,
" " LOOSE "
" " JOURNAL "
" " WICK "
" " MILL BOARD,
" " SHEATHING PAPER,
" " FLOORING FELT.
" " CLOTH.

PATENT
Galvanized Iron Tackle Blocks
For all Hoisting Purposes. Tight, Easy Running, Durable. Superior to all Wood Blocks. Cheaper than all other Iron Blocks.
PROVIDENCE TOOL CO.,
Providence, R. I.

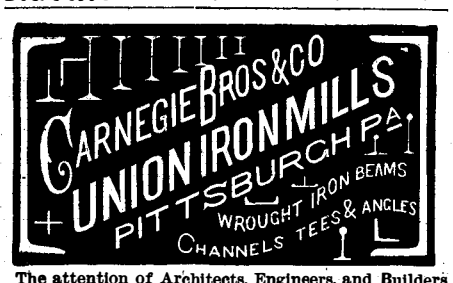
GENUINE BABBITT METAL,
Fine Brass and Composition Castings,
E. STEBBINS M'F'G CO., SPRINGFIELD, MASS.

The Rodier Patent Single Iron Plane.

Made of extra quality iron. A practical labor saving tool. Cuts against the grain equally as well as with it. Can be adjusted instantly to cut a coarse or fine shaving, and excels any double iron plane ever produced. Address LAFLIN MANUFACTURING CO., North Elm Street, Westfield, Mass.

AIR COMPRESSORS.
THE NORWALK IRON WORKS CO.,
SOUTH NORWALK, CONN.

BIG PAY to sell our Rubber Printing Stamps. Samples free. Taylor Bros. & Co., Cleveland, O.

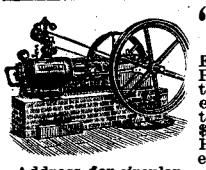


The attention of Architects, Engineers, and Builders is called to the great decline in prices of wrought
STRUCTURAL IRON.
It is believed that, were owners fully aware of the small difference in cost which now exists between iron and wood, the former, in many cases, would be adopted, thereby saving *insurance* and avoiding all risk of *interruption* to *business* in consequence of fire. Book of detailed information furnished to Architects, Engineers, and Builders, on application.

THE TANITE CO.,
STROUDSBURG, PA.
EMERY WHEELS AND GRINDERS.
LONDON—9 St. Andrews St., Holborn Viaduct, E. C.
LIVERPOOL—42 The Temple, Dale St.

A USEFUL UNITED STATES PATENT FOR SALE, address JOSEPH SEILER, Norwalk, Conn.

H. W. JOHNS' ASBESTOS ROOFING.
The Asbestos Roofing (with white or light gray Fireproof coating) is now in use in all parts of the world, and is the only reliable substitute for tin. It is adapted for steep or flat roofs in all climates. It costs only half as much as tin, and can be easily applied by any one.
☞ Note the address, send for samples, and be sure and get the *genuine*, which is manufactured only by
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York,
sole manufacturers of genuine Asbestos Liquid Paints, Boiler Coverings, etc.
Descriptive Price Lists free by mail.



"RELIABLE"
Engines a complete success. Prices still 40 per cent. below those of other makers. Unequaled for efficiency, simplicity, and durability. Prices from $250 for 10 H. P., to $400 for 30 H. P. All complete, with Governor, Pump, and Heater.
Address, for circular, HEALD, SISCO & CO., Baldwinsville, N. Y.

ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free.
Agents Wanted. T. NEW, 32 John Street, New York

$777 A YEAR and expenses to agents. Outfit Free. Address P. O. VICKERY, Augusta, Maine.

BROWN'S PAT. SPLIT Shafts. Hangers. PULLEYS
At low prices. Largest assortment. A. & F. BROWN, 57, 59, & 61 Lewis St., New York.

Gear Molding without Patterns
Scott's Gear Moulding Machines,
AIR COMPRESSORS & ROCK DRILLS.
DELAMATER IRON WORKS,
Boiler Makers, Engine Builders, and Founders,
FOOT OF W. 13th ST., North River, NEW YORK.
ESTABLISHED 1841.

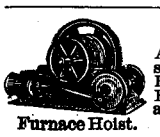
FRIEDMANN'S PATENT
EJECTORS
Are the cheapest and most effective machines in the market for
Elevating Water and Conveying Liquids
from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are splendidly adapted for conveying liquids in Breweries, Distilleries, Sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.

BOYLE ICE MACHINE CO.,
10 N. Jefferson St., Chicago, Ill.
The best Ice and Refrigerating Machines of all sizes and for all purposes guaranteed. Send for circular.

TELEPHONE Works 1 mile. Price $3.50. Pat'd Circulars free. HOLCOMB & Co., Mallet Creek, Ohio.

THE PICTET ARTIFICIAL ICE COMPANY, Limited,
Ice Machines to make from 20 pounds per hour to 50 tons per day, at 36 Cortlandt St., New York. P. O. Box 3083.

The Famous 15 Puzzle by mail 15c. Agts. Wanted. Stamps taken. Dunbar & Mitchell, Bristol, Conn.


Furnace Hoist.

ELEVATORS.
All kinds of Hoisting Machinery a specialty. Steam, Hydraulic, and Belt Power for Passengers and Freight. Iron Furnace Lifts, Portable Hoists. STOKES & PARRISH, 30th and Chestnut St., Phila, Pa.

WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements, from 10 to 1,000 H. P.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 50 Gold St., New York.

© 1880 SCIENTIFIC AMERICAN, INC